3206

FARMERS DIGEST

CURRENT JAN 2 1952 U.S. DEPARTMENT OF AGRICULTURE

January, 1952

Volume 15 — $2.50 a Year
Number 7 — 25¢ a Copy

Rotation Fertilization ..... *Better Crops with Plant Food* 1
Less Udder Trouble ..... *Successful Farming* 5
F.A.O.—Bulwark of Freedom ..... *The Nation's Agriculture* 7
Grassland Farming ..... *Holstein-Friesian World* 11
Good Ventilation Pays ..... *Poultry Tribune* 15
The Grass You've Wanted! ..... *Missouri Ruralist* 18
A Long-Drawn Question ..... *Foreign Agriculture* 20
Time Isn't Important to a Hog ..... *The Ohio Farmer* 27
Don't Put Up with Garlic ..... *Farm Journal* 29
A New Market for Milk ..... *American Agriculturist* 30
Floor Control Program ..... *Soil Conservation* 33
Heat Lamps in Brooding Chicks ..... *Rural Electrification News* 43
Yard Lighting for the Farm ..... *The Southern Planter* 48
How Our Allies in Europe Farm ..... *New Jersey Farm and Garden* 50
Losses from Intestinal Parasites ..... *Everybodys Poultry Magazine* 54
The Battle for Clean Streams ..... *Pennsylvania Farmer* 57
Antibiotics and Plant Protection ..... *World Crops* 59
Marketing Alfalfa-Brome Through Steers ..... *Iowa Farm Science* 67
Side Opening Milk Cooler ..... *New England Homestead* 75
Soil Fertility and Human Nutrition ..... *Farm Research* 77
Eggs and Health Make the Flock Pay ..... *Rural New-Yorker* 81
Feeding Your Swine ..... *The Hog Breeder* 84
Turkey Broilers ..... *American Poultry Journal* 90
Brome Will Strangle Quackgrass ..... *Capper's Farmer* 92
Index 95

For the Farmer's Library

The Farmer's Digest

EDITORIAL STAFF:
Editor—L. Bush-Brown Assistant Editor—C. Leavitt Dyer
Business Manager—A. E. Heick

Associate Editors—
John A. Andrew, Jr., James Bush-Brown, Ruth Patrick

ADVISORY EDITORIAL STAFF:

William A. Albrecht
Chairman, Department of Soils
University of Missouri

John D. Beck
Professor of Veterinary Medicine
University of Pennsylvania

Hugh H. Bennett
Special Assistant to the Secretary of Agriculture

H. J. Reed
Dean of the School of Agriculture
Director of the Experiment Station and of
Agricultural Extension, Purdue University

W. T. Spanton
Chief, Agricultural Education Service
United States Office of Education

M. L. Wilson
Director of Agricultural Extension
United States Department of Agriculture

The Farmer's Digest
Published Monthly except July and September at Ambler,
Pennsylvania, by the Farmer's Digest, Inc.

25¢ a Copy *1 Year $2.50*
2 Years $4.50 *3 Years $6.50*
Canadian and Foreign Subscriptions $3.00 a Year

Entered as second-class matter at the Post Office at Ambler, Pa., July 30, 1948, under act of March 3, 1879. Additional entry at Lancaster, Pa.

The Farmer's Digest

Volume 15 January, 1952 Number 7

Rotation Fertilization

Condensed from Better Crops With Plant Food

James H. Eakin, Jr.
Pennsylvania State College

THE "Big Three" of soil productivity maintenance are lime, fertilizer, and organic matter. Haphazard systems of soil management may provide adequately for one or even two of these essential factors; but to neglect the third may seriously limit crop production. The use of lime and fertilizer will be greatly enhanced if provisions are made for the replenishment of organic matter. Research has shown that crop yields may be limited as often by poor soil physical condition as they are by lack of essential plant nutrients. Conversely, if adequate plant nutrients are not used, lime and organic matter cannot work efficiently to produce high yields.

Lime needs are comparatively easy to correct. A soil acidity test will show the amount of liming materials needed. On the other hand, many soil management programs do not make adequate provision for replenishment of organic matter and plant nutrients. Perhaps these two soil productivity factors are not properly understood since they must be considered at the same time. For instance, many farmers tend toward a short rotation, high fertilization, and little sod. They attempt to substitute plant nutrients for organic matter. The former can be purchased in commercial fertilizers; the latter cannot. Such a program may increase total production for a few years, but as the supply of organic matter decreases, fertilizer efficiency drops sharply.

What is the explanation for this drop in the crop-producing power of fertilizer? It takes about five million pounds of water to produce 100 bushels of corn. Soil robbed of organic matter through insufficient use of sod crops cannot

Reprinted by permission from Better Crops With Plant Food, Washington, D. C., October 1951

efficiently absorb rainfall. It lacks spongy humus for holding water. When crops cannot secure enough moisture, fertilizer addition will not increase yields; in fact under this condition, fertilizer salts may actually decrease yields. For this reason and many others the maintenance of organic matter at a level that is normal for any particular climate is essential for efficient crop production.

Several other reasons why organic matter maintenance should be considered one of the basic objectives of good soil management can be cited: (1) Improves soil aeration; (2) allows maximum expansion and development of plant roots; (3) absorbs toxic substances from the soil solution which could be injurious to plant development; (4) provides a storehouse of nitrogen as well as other plant nutrients; (5) stabilizes soil granules; this, in turn, helps to prevent erosion.

To study further the interrelations between organic matter and fertilizer, let us cite another example of poor management. All too frequently farmers fertilize their cash crops, which is good practice, but fail to apply any fertilizer to their sod crops. This has resulted in hay yields that average only from 1 to 1½ tons per acre. Much of this hay is of doubtful quality because of the poor performance of the legumes in the mixture. This half-way fertilization practice also results in lower yields of cash crops because the poor sods turned under are shy in organic matter. With such a program the farmer loses every time. It takes commercial fertilizer to produce humus, and it takes humus to produce crops.

Any effective system of soil management must take into consideration all of the factors that contribute to successful crop production. The best entry into an efficient soil-building program is by way of the crop rotation. The rotation should employ, at the minimum, 25 per cent of the cropland in sod at all times. The fields should be fertilized according to the rotation used. Instead of considering each crop individually, the entire rotation should be kept in mind. Every acre of cropland should receive an annual application of fertilizer. Special effort should be directed toward higher producing sods as these automatically increase yields of cash crops and total production.

Pennsylvania's new plan of rotation fertilization attempts to keep the basic fundamentals of soil productivity in line at all times. All crops receive an ample supply of lime and plant nutrients. The fertilization system is not recommended for those farmers who do not employ sod crops in their rotations.

An example of how rotation fertilization works can be cited in

the corn, grain, hay rotation. Any one of the following conditions may exist on potential corn land —and each condition requires a different fertilization program:

1. Legume sod, (6-8 tons phosphated manure)
2. Grass sod, (6-8 tons phosphated manure)
3. Legume sod, not manured
4. Grass sod, not manured

If the legume sod has consistently received good fertilizer and manure treatments, high rates of fertilization generally will not be a paying proposition. Under this condition 100 to 200 pounds of 5-10-10 per acre applied in the row will be sufficient fertilizer to produce the most efficient corn yields. Number 4, poorest situation of those listed, usually involves a deficiency of nitrogen. Plowing down 50 to 75 pounds of actual or elemental nitrogen per acre will supply that plant nutrient. In addition, 300 pounds of a 5-10-10 fertilizer per acre should be applied in the row. The first step toward rotation fertilization has been accomplished; the crop was fertilized according to the specific condition that existed.

In planning a small grain fertilization program, either of the following two conditions may exist:

1. Small grain seeded to hay or pasture.
2. Small grain, not seeded.

The first condition presents two crops to be fertilized; the second, only one. When small grain is seeded to a legume grass mixture there is an excellent opportunity to place fertilizer in the feeding zone of next year's hay crop. Therefore, it is recommended that 300 pounds of 0-20-20 fertilizer per acre be plowed down or drilled deeply when preparing the seedbed. In addition, 300 pounds per acre of grain fertilizer, such as 5-10-10, 4-12-8, or 2-12-12, should be drilled when the small grain is sowed. If the small grain is seeded alone, 300 pounds per acre of a complete fertilizer, such as 5-10-10, should be sufficient in most cases. If lodging of the grain has been a problem in the past, fertilizers carrying no nitrogen should be used.

After the first year hay or pasture crop is removed, it is time to consider replacing in part those plant nutrients that have been removed. In Pennsylvania, good results have been obtained by topdressing those hay fields in the fall of the year. About August 15 to September 15, 400 pounds per acre of 0-20-20 fertilizer should be applied. A similar application is recommended each fall as long as hay is to be cut the next year. This timing of fertilizer application enables the legume plants to build up sufficient carbohydrate root reserve to winter over and shoot a good top the next spring. It also means the soil is receiving fertilizer

when plant-nutrient reserves are at their lowest point. Cooler weather and increased rainfall will enable the legumes to make quick use of the fertilizer.

To many farmers, 400 pounds of 0-20-20 per acre per year seem to be a great deal of fertilizer. However, in view of what is coming from the land in plant nutrients they might think otherwise. One ton of alfalfa hay removes about 45 pounds of potash per acre. Suppose a yield of 4 tons is removed. This would represent a removal of 180 pounds of potash. Through weathering processes the soil will return approximately 20 to 50 pounds per acre per year. Erosion, leaching, and fixation by clay minerals will cut down on that supply. Six tons of well-preserved farm manure will return about 60 pounds of potash of which approximately one-half will be available the first year. With the 4-ton yield of hay there will be 100 to 130 pounds of potash that must be replaced. These figures represent only one year's production. When one considers a 20- or 30-year period, it is easy to see why certain farms which once produced good alfalfa and clover hay yields cannot produce half a crop now.

Examples of crop situations cited in preceding paragraphs have been used merely to show how rotation fertilization applies under specific conditions. Far too many soil-improving practices are based on generalizations or habit. Rotation fertilization is based upon fitting the practice to the situation that exists. Over the last 50 years, agricultural research has developed much information on use of fertilizer.

As farmers become better acquainted with the factors involved in crop production, they are better able to evaluate specific conditions and utilize fertilizer recommendations. Soil-testing procedures are much more accurate today and should be used to achieve more efficient fertilizer usage. Soil tests performed by competent personnel have enabled the farmer to obtain a better idea of the amounts and kinds of nutrients to add.

Farming has become a keenly competitive enterprise. Costs and operation efficiency vary greatly from one farm to the next, but the fertilizer bill is still one of the highest costs even on the most efficient farms. Rotation fertilization is an attempt to drive the efficiency on all farms upward.

Less Udder Trouble

Condensed from Successful Farming

J. C. Nageotte
Pennsylvania State College

MANY a useful dairy cow has gone to the butcher because of udder trouble. And, in most cases, mastitis or some other udder infection has been the cause. Premilking (milking the cow before the calf is born) is now saving many dairy cows from the slaughterhouse by detecting and clearing up the trouble, before it has a chance to ruin the udder.

The premilking idea isn't exactly new. In fact, some farmers for years have been premilking their cows before freshening. Their own observations have told them when to premilk and when not to.

However, up until a few years ago, most dairymen have steered away from premilking because they believed it was a bad practice, and that it would cause milk fever. In some cases, their cautions are justified. There's lots more to premilking than just getting the cow in the barn a couple weeks before freshening and milking her dry.

Experiment stations have been working on the idea of premilking for years. Dr. Everett Keyes of the Pennsylvania Experiment Station, started an intensive study in 1940. He wanted to find out what effect premilking would have on the amount and composition of the milk, the bacteria in the milk, on the condition of the calf, and on the physical condition of the cow herself.

When to premilk. Some valuable and practical information has been gathered over the years from this experiment which may be used as a guide by the farmer in determining when to premilk and when not to:

1. Premilking never does any harm if started in time. If milk is in the udder, don't premilk unless it is mastitis milk.

2. There is less swelling in the udder at calving time, and the swelling does not last as long if heifers and dry cows are premilked. This is especially true with heifers calving for the first time. For this reason it is a good idea to premilk all first-calf heifers.

Reprinted by permission from Successful Farming,
Des Moines, Iowa, April 1951

3. Premilking probably doesn't affect milk fever or acetonemia.

4. It doesn't hurt the calf if the dam is premilked. However, it is a good idea to freeze the colostrum and keep it for the calf. A tablespoon of cod-liver oil added to the colostrum will give the calf added protection against disease.

5. Every cow's udder should be examined as she starts to "make bag." If the secretions in any quarter show mastitis, premilk all four quarters twice a day until freshening. If the secretion is normal, little is gained by premilking.

When not to premilk. If there is milk in the cow's udder, you had better hold off premilking, as the cow is due to calve soon. Chances are if milk is present, it is too late for premilking to do any good, and it may bring on a case of milk fever.

Also, if the secretions in the cow's udder are clear and amber-colored, there is no need for premilking, as this is a sign of a healthy udder.

Bacteria always in udder. Probably the most interesting and valuable findings of this study was the effect of bacteria on cows' udders.

At the same time Doctor Keys was conducting his experiment on premilking, Drs. Ted Anderson and James Reid were making a mastitis study. They found that mastitis might be associated with any of several strains of bacteria. Some of these strains were present in the udders of the premilked cows, and even in heifers which were to freshen.

They also found that one out of six cows had developed mastitis, in one or more quarters, beyond the cow's ability to control the disease.

The premilking secretions from a healthy udder are amber-colored, thick as honey, and clear. If mastitis has started, the secretion becomes cloudy, thin and watery, and often contains white lumps. Sometimes it is pink with blood which has seeped through broken or damaged blood vessels, and in some cases, it is a creamy white pus.

Premilking clears up most cases. Cows in this premilking experiment which had developed mastitis before calving were, in most cases, cleared up by calving time. Several times the trouble flared up shortly after calving. No quarters infected with mastitis were lost or even permanently damaged if the cow was premilked. Premilking did not help those quarters which had been damaged or lost before premilking.

No cause was found as to why mastitis develops in some cases during the dry period. However, if it did show up, premilking evidently removed the bacteria before they could grow enough to permanently damage the udder. Premilking also helped the cow build up resistance.

Milk production not affected. In this experiment, premilking did not hurt the cows' production in the following lactations. The premilked cows averaged a little more milk than those allowed to freshen normally, but Doctor Keyes felt that this increased production was not significant.

Not all swelling was prevented by premilking. But, swelling of the udder at calving time was definitely less in premilked calvings, and the swelling which appeared did not last as long as when the cows were not premilked.

Preserving colostrum for calf. Then there's the question of what to do about providing the calf with the colostrum, or first milk, from the cow if she is premilked. One solution is to store the colostrum by refrigeration until the calf is born. However, there is less vitamin A in milk produced after calving when the cows are premilked.

For this reason, it is a good idea to add extra vitamin A to the calf feed for 10 days following calving. Or, the calf can be fed colostrum from another cow. No calves were lost, nor was any extra trouble experienced in raising calves, following premilking.

There are a few rules to follow in premilking, but if handled right, they are safe and practical to use. It can mean a healthier udder which will add several years to the cow's productive life.

F.A.O.—Bulwark of Freedom

Condensed from The Nation's Agriculture

Gwynn Garnett

DURING the last war a series of experiments were conducted to determine the effects of starvation and hunger on human beings. The "guinea pigs" in these experiments were several volunteers from a group of conscientious objectors who had been interned for the duration. These young men, most of them idealistic and highly intelligent, were confined together and their food rations gradually reduced to a bare subsistence level. During the course of the experiment their actions and attitudes were carefully watched and analyzed. Even their conversations were monitored. In addition to the gradual loss of energy of the body, it was noted that lethargy of the mind replaced the former activity. Spirited conversations on democracy and civil liberties gave way

Reprinted by permission from The Nation"s Agriculture, Chicago, Illinois, November 1951

to ever-increasing selfishness, short-temperedness, and melancholia. In short, the idealistic interests of these young men vanished gradually as their food diminished, until in the last stages of the experiment they were much like animals in their complete disinterest in anything but food.

The lessen to be drawn from this experiment is obvious. You cannot expect a half-starved human being to think in terms of democracy, individualism and human liberty. You cannot expect such a person to be vigorous in either body or mind in defending principles which to him have little meaning while the gnawing pain in his stomach continues. Recent history has shown that the hungry, dissatisfied and miserable are the easiest prey for the false promises of totalitarianism. Communism has made its greatest inroads where economic well-being has been at a premium. Conversely, it is equally true to say that democracy, individualism and interest in peace have thrived best in those areas of the world where human dignity is buttressed by reasonable standards of physical security and well-being to make the principles of democracy meaningful.

One of the outstanding efforts being made today to win man's heart and mind through a victory over hunger is being made by the Food and Agriculture Organization of the United Nations. This organization is not an international dole system, but a carefully directed (and financed) effort to educate the people in underdeveloped regions of the world in the techniques of improving their economic condition. Operating on an extremely small budget, considering the magnitude of the task, this organization is bringing return dividends many times in excess of the original investment. By elevating economic conditions of the underdeveloped countries, this organization is making a substantial contribution to the blocking of Communist infiltration and subversion.

Many of the results of FAO's efforts will not be seen for many years; and still other effects, while already apparent, are extremely difficult to measure in concrete terms. Other activities of the organization, however, are tangible and dramatic. Take FAO's fight against rinderpest, for example. Rinderpest is an animal disease many times as serious as foot and mouth disease for it is 90 per cent fatal to cloven-hooved animals when the disease strikes an area. In the vast areas of Asia, the Near East, and Africa where rinderpest is endemic, the disease kills one million cattle a year. This great loss of cattle would be a national disaster in any country, but is particularly serious in the poorer countries of the world where the

animal is grown to pull the plow, haul loads, and stomp out the grain. The water buffalo is the tractor of Asia, the only draft power available to millions of farmers in that part of the world.

FAO has been fighting rinderpest in many countries. It has made control of rinderpest and eventual eradication possible for any country with enough technicians and the will to wipe out this scourge. In Thailand, for instance, where rinderpest has been rampant for many years, FAO helped government veterinarians carry out a country-wide vaccination program. Its success is certain, for during the past two years there have been no outbreaks of the disease in all of Thailand.

In Ethiopia, FAO now has three veterinarians and a bacteriologist working with the government veterinarians and native field teams on a mass immunization program. To date more than half a million cattle have been immunized in this country alone, and now the vaccine program is on a self-paying basis; each Ethiopian farmer pays 50 centimes (about 20 cents) for each cow immunized.

Once rinderpest is wiped out, there will be milk, meat and other livestock products for the people of Ethiopia as well as animal draft power and a source of income.

Another highly important area of FAO's activities is the field of conservation. FAO is taking active steps to bring to life various arid regions of the world. Pakistan, for instance, has both arid lands and waterlogged lands. FAO experts are now hard at work teaching local technicians how to drain the waterlogged areas and restore this salty land to fertility, while in upstream areas they are laying plans for getting water to arid soil, thus considerably increasing crop acreage of the country.

Equally dramatic is FAO's work in the field of nutrition. In Greece, where a few years ago the population was nearly prostrate from hunger and malnutrition, the FAO has been conducting a nationwide educational program. An FAO nutritionist and a group of home economics graduates travel about showing the housewives how to prepare nutritious meals and teach other elementary facts about more healthful diets. During a two-year period some 1500 talks and 527 demonstrations were given.

Another example of the very simple means employed by the FAO to improve the well-being of a country may be found in Haiti. FAO transplanted from Thailand to Haiti a fish called the Sepat Siam which is capable of living in mud if the gills are moist. This fish is now raised in the rice paddies. When the water in the paddies is drained off at harvest time, the farmer is able to harvest

a double crop of fish and rice where before there had been but one crop. A few of the fish are left alive in the mud for breeding and future harvests. So again we have an illustration of FAO's efforts in under-developed areas to bring renewed vigor to the minds and bodies of thousands of depressed people.

The examples which have been given of FAO activities constitute a very small portion of the organization's total program. In spite of its meager budget of five million dollars, FAO is bringing returns to the world many fold greater than the investments being made.

The FAO is an *international* organization—not purely American effort. FAO's 65 member nations contribute to its yearly budget. Of the five million dollar annual budget, the United States pays one and a quarter million, the other member countries paying the remaining three and three-quarter million. (The contribution of the United States is less *per person* than several of the other member countries—Australia and Sweden, for instance.)

As is the case with all member countries, the U. S. benefits from FAO activities. During the period 1936 to 1940, the U. S. was able to sell abroad to the 15 more highly developed countries of the world goods equal to about $5.80 per person; while in ten partially developed countries these sales amounted to only $1.25 a year per person; and in 28 under-developed countries each person averaged only 70 cents worth of U. S. goods per year. To a country like the United States with great productive potential, the development of countries now poverty stricken and unable to share in the world's exchange of goods offers the only hope of increasing world trade so essential to continued prosperity in the U. S. and elsewhere. The alternative to an expanding economy is restriction of production, a road which was followed between the two world wars with disastrous consequences.

There are many other benefits to the United States. FAO collects and distributes to its members economic and statistical information relating to food and agriculture, forestry and fisheries. FAO acts as a clearing house for the collection and exchange of scientific and technological information in many fields. And the organization promotes the exchange of agricultural students and professors.

U. S. farmers, businessmen, and defense officials are deeply concerned that the free world's production of food, fibers, and forestry products be adequate to meet both civilian and defense needs. In many instances, the FAO is our only source of information on the free world's production of these vital products. Through the interchange of scientific information,

the U. S. is often benefited by improved seed strains and livestock breeds. Lastly, the U. S. spends many millions of dollars each year to enforce its quarantine laws. FAO is making an international effort to improve the quarantine standards of other countries; and, as the organization's efforts become more effective, the U. S. should benefit greatly through lessening of the dangers of importation into the U. S. of infected plant and animal stock and of insects and diseases.

In summary: FAO is a great force in building the will to resist Communism in many areas of the world. By raising living standards in under-developed areas it is achieving worthwhile humanitarian goals which are the very fountainhead of democracy. The organization is benefiting the United States directly by making available technical information and scientific material which aid in improving our own standards.

The present world conflict is half military and half ideological. In our haste to achieve military power, let us not forget the importance of the ideological struggle and the means by which that battle can be won. It is not a question of more swords and fewer plowshares, or of more plowshares and fewer swords. In the present struggle we must have more of both.

Grassland Farming

Condensed from Holstein-Friesian World

Dr. C. B. Bender

Research Staff, Sperry Corporation

GRASSLAND crops are the most important sources of feed nutrients on dairy and beef farms. They also play an important role on other types of farms.

To the dairyman and beef breeder, pastures, grass silage and hay furnish the cheapest feed nutrients. Grassland crops in all types of farming furnish land cover to prevent wind and water erosion, and organic matter to increase the water-holding capacity of the soil. They also improve the physical character of the soil and increase soil fertility.

Grassland farming, correctly interpreted, is a system of farm management where most of the farm area is seeded to perennial legumes and grasses. The system

Reprinted by permission from Holstein-Friesian World, Lacona, New York, November 3, 1951

is based on a long rotation. The seedlings of taller growing legumes and grasses used in this system of management should not be considered permanent in any sense of the word. Their length of tenure in a stand will depend on their productivity while their productivity and longevity depend upon management.

In order of importance, pasture is the number one grassland crop. This is, in reality, the dairyman's cash crop. It is, in fact, the only cash crop grown on the farm which is harvested daily without human labor and which returns an income every two to four weeks for a period of from five to seven months in the Northeastern States.

In terms of management for greatest returns, the following points are of greatest significance:

1. Plan a pasture layout consisting of five or six fields of about the same size so that they can be rotationally grazed. Have a source of water available in each field or available to the cattle when they are in each field.

2. Have the total area of these pastures equal one to one and a half acres of pasture for each mature animal in the herd. Whether one acre or more is used depends on the productivity of the land.

3. Seed these pastures down to mixtures of the taller growing legumes and grasses. The seeding mixtures will depend on the soil type. It is not advisable to use the same seeding mixtures over the entire area because this makes grazing management extremely difficult.

For early grazing and good summer grazing, two of the pastures should be seeded to a combination of ladino clover and orchard grass. Two could be seeded to ladino clover and brome grass. If the other two pasture areas are adapted to alfalfa, these could be seeded to a combination of alfalfa, brome grass, and ladino clover. If some of the fields are poorly drained, reed canary grass and ladino clover could be used for the mixture. These seeding mixtures have different maturity dates, which makes grazing management easier.

4. Keep the pasture adequately limed and fertilized. The pH of the soil should be kept at about 6.5. The fertilizer is both a tool of production and an aid to management. Fertilizer applied to pastures late in the fall or early in the spring stimulates early growth of pasture. Fertilizer applied after a pasture has been grazed the first time stimulates subsequent growth of pasture.

When the legumes dominate the stand, applications of 0-12-12 or 0-20-20 are in order, in amounts ranging from 500 to 1,000 pounds per acre. Where 1,000-pound rates are used, split applications are better, especially on lighter soils.

Where the grasses dominate the

stand, 5-10-10, 7-7-7, or 10-10-10 fertilizers stimulate the greatest yields.

5. Pastures should not be overgrazed. Overgrazing weakens the stand, reduces penetration of water into the soil, and slows up renewal growth. Ladino clover combinations are best grazed down to a height of three to four inches.

6. The mowing machine is the most important piece of equipment in pasture management. The mowing of a pasture, after the cattle have grazed it, helps to eliminate weeds, keeps the pasture vegetative, prevents the seeding of undesirable grass species, and reduces pollution.

7. The dairy cow will consume from 120-150 pounds of good-quality pasture a day if it is available. That means 13.5 tons of pasture per cow for a six months pasture season. It takes sound planning to furnish this amount of grazing but this type of management pays off. Pasture furnishes the cheapest nutrients for milk or meat production.

It is not exceptional for an acre of ladino clover-orchard grass to yield 20 tons of green weight per acre. That means an acre of this mixture will furnish between 4,800 and 6,000 pounds of total digestible nutrients. In terms of grain feed nutrients, that would be equivalent to the nutrients in 66-82 bags of grain feed having a protein content of 20 percent.

Grass silage is the second most important grassland crop. By making grass silage out of part or most of the first cutting of hay crops, a highly nutritious, succulent, winter forage is insured for the herd.

By making silage out of this first cutting, the livestock man conserves a large percentage of the nutrients that normally would have been lost in haying operations due to the unsettled weather conditions in early June. By getting these cuttings off the land early, farming operations are speeded up and better second growths are produced for hay making when good haying weather is the rule rather than the exception.

In the making of legume and grass silage, a preservative should be used. In the East molasses is the cheapest preservative to use. Furthermore, it is the cheapest purchased feed. The addition of the molasses, at the rate of 80-100 pounds per ton of green material being ensiled does two things. First, it furnishes the best type of sugar for bacterial action which turns the crop into silage, and, secondly, it increases the feeding value of the silage. A crop preserved with this amount of molasses insures a high quality silage, with a clean, acid odor, in which no butyric acid is formed. This Butyric acid is commonly found

in improperly made silage, which causes off flavors in milk. Well-preserved grass silage fed after milking produces milk of the highest quality and flavor score.

Grassland crops of alfalfa, or alfalfa and timothy, or alfalfa and brome grass, adequately fertilized in the same manner as recommended for ladino clover mixtures, will outyield corn on a green-weight basis on most farms in the Northwest. Furthermore, it can be done at a lower cost. On land not adapted to alfalfa, mixtures of red clover and the grasses, or ladino clover and the grasses, make excellent grass-silage crops.

Quality hay is the third most important feed nutrient source in a grassland program. In making grass silage out of first cuttings of hay crops, the haying operations for the most part are confined to mid, or late July, and in some sections third cuttings are made in late August or the first week in September. Usually at this time of the year better haying weather is the rule and high-quality, leafy, green hay can be made for winter feeding. The haying program is not in conflict with any other farm operation and the operator can concentrate on the problem of making hay of the highest feeding quality.

When the grassland crops of the highest quality are fed liberally to better than average cows, it is possible to maintain better than eighty percent of their production without grain feed. Most dairymen get only 50 percent of the herd's production out of roughage crops. The balance of the production must be stimulated by grain feeds, which are the most expensive source of nutrients. The penalty of feeding poor-quality roughage is lower milk production unless extra grain is fed over and above the normal grain to milk ratio, which means higher-cost milk.

In a grassland program of farm management the farmer concentrates on the production of feed nutrients which constitute the major portion of the animal's ration.

He concentrates on the production of feed nutrients which can be grown at the lowest unit cost.

In this system of management more producing units (cows) can be carried on a given area of land.

By eliminating grain farming on dairy farms the greatest conflict in the production and harvesting of grassland crops is removed.

Grassland farming properly mechanized makes labor more productive and there is better labor distribution.

Grassland farming helps build soils.

Grassland crops produce milk of the highest quality and flavor.

Replacement animals can be grown more cheaply with high-quality grassland crops.

A system of farm management which embraces high-quality and abundant pasture, well-preserved legume-grass silage, and hay of the highest feeding quality is the aggressive approach to the economical production of milk and meat.

Good Ventilation Pays

Condensed from Poultry Tribune

Paul R. Hoff
Cornell University

THE investment in a good ventilation system for a poultry house pays big dividends. The dividends come back to the poultryman in the form of dry litter that can be used an entire season without changing; fewer dirty eggs to clean because the litter is dry; less moisture on the walls and ceiling resulting in fewer repairs to the building; and fresh air free from ammonia fumes in which to do the poultry house chores.

The purpose of a ventilation system is to move enough air through the building to carry off the moisture which the hens give off in their breath and in their droppings.

In a poorly ventilated laying house, most of the moisture which the hens take in as drinking water stays right in the house. One hundred heavy breed hens will consume about six gallons of water each day. This weighs about 50 pounds. With 70 per cent production, about five pounds of this water is carried out in the eggs, but the remaining 45 pounds, or about five gallons, is left in the pen. The result is about the same as it would be if five gallons of water for each 100 hens in the house were thrown on the floor. This water should be removed by good ventilation which consists of moving just enough air through the building to keep the litter dry, and the walls and ceiling from collecting moisture on the surface. Excessive air movement through the house results in needless low temperatures in cold weather.

Poultrymen sometimes get into trouble with a wet floor even with a good ventilation system, when they overcrowd the house. No ventilation system can operate successfully if the house is carrying more birds than is considered good practice.

Houses with the roof and the side walls insulated may be easier to ventilate than uninsulated houses. Insulation of the walls and

Reprinted by permission from Poultry Tribune,
Mount Morris, Illinois, November 1951

roof eliminates cold surfaces on which moisture can condense. It also helps to keep the temperature more comfortable in cold weather, even with the ventilation system moving air through the house in sufficient amounts to keep the litter in good condition.

A well-planned ventilation system does not create drafts that may be harmful to the health of the hens. Electric fans can be used to move air through a building in a positive manner and in controlled amounts. In the usual installation, fans are used to exhaust the air from the building. Incoming fresh air must be admitted through intake openings, which are designed to allow the fresh air to enter without creating a draft on the floor.

The electric fan works best when it is installed in an outside wall near the ceiling. It should be enclosed in a duct that extends from the ceiling to within 15 inches from the floor or the top of the litter. Opposite the fan at the top of the duct, it is desirable to have a hinged panel which can be opened for servicing the fan and for warm-weather ventilation. With this arrangement, the fan picks up the air from near the floor during cold weather, thus conserving the heat given off by the hens. In warm weather, with the hinged panel open, the fan exhausts the warmer air from near the ceiling.

The size of the fan should be based on moving 40 to 60 cubic feet of air for each 100 pounds of animal weight in the pen. The total capacity of the fan should equal the number of hens normally carried in the pen. One fan for a floor is sufficient provided there are no solid partitions to interfere with the free flow of air. In extremely long houses, it may be desirable to use more than one fan, locating them some distance apart. Houses up to 100 feet long are being successfully ventilated with a single fan located near the center of one of the long walls. In the colder sections of the country, some poultrymen prefer to use two smaller fans to move the necessary amount of air in place of a single larger one. This makes it possible to reduce the amount of air moving through the house during extremely cold weather, and thus conserve the animal heat given off by the hens.

An electric fan used in poultry house ventilation must be capable of running for a long period in dusty air without frequent attention or lubrication. This condition requires a fan with a totally enclosed motor so that dust cannot penetrate.

The motor bearings must have a lubricant sealed in them for the life of the motor, or they must have large oil reservoirs that can hold enough for at least six-months' operation without atten-

tion. A thermal-overload switch is necessary in the motor or in the motor circuit to protect the motor from burning out and possible destruction of the building by fire should the motor overheat from any cause. Any electrician can install a thermal-overload switch or a delayed-action fuse of the correct capacity in the motor circuit. There should be no electrical appliances or outlets connected into the circuit between the protective device and the motor.

Fresh air intakes distributed around the outside walls of the laying house are necessary to admit fresh air to all parts of the pen without creating a draft on the floor. Locating the fresh air intakes high in the side wall permits the incoming air to mix with the warmer air inside as it falls along the side walls and circulates through the pen. Baffles should be provided to protect the openings of the intakes.

If the fresh air intakes are made with 60 square inches of opening (3×20 in., 4×15 in., 5×12 in., etc.), one intake for each 250 square feet of floor is necessary. Isolated damp spots on the floor indicate incorrect location of the fresh air intakes. This condition can usually be remedied by relocating an intake to increase the positive air movement in the damp area. *Wet spots caused by drinking fountains cannot be eliminated by the ventilation system.*

In houses already built, it may be possible to use some of the windows as fresh air intakes and not cause floor drafts. Double-hung windows can be used easily. It is necessary only to fasten a one-inch board 5 or 6 inches wide to the lower part of the window frame just above the sill. Raising the lower sash approximately one inch provides a sufficient fresh air intake opening. One baffled window intake is sufficient for 250 square feet of floor area.

During the season when it is necessary to close the house, all doors and windows must be tightly closed, unless the windows are used as fresh air intakes. All air movement when the fan is running is then through the ventilation system. The panel behind the fan in the outtake duct should be closed. This forces the fan to pick up the air from near the floor. For warm weather operation, the doors and windows can be open, and the fan duct panel should be open also. The fan will then pull air from the ceiling.

Although the exact location of the exhaust fan and duct is not all-important, it is desirable to place them near the center of one of the long walls of the building. In very large houses, the fan and duct assemblies of the same capacity should be located to draw from floor areas of the same size. It is preferable to locate the fan

on the side away from the prevailing wind. *The fan and duct should be at least eight feet away from any window, door, or fresh air intake.*

In some laying houses, because of location or construction, it may be necessary to close or partially close most of the fresh air intakes on the same side of the building as the fan, thus forcing the fan to pull the air across the house. During high winds, adjust the intake to reduce the amount of air coming into the pen.

The Grass You've Wanted!

Condensed from Missouri Ruralist

Cordell Tindall

How would you like to grow a grass that comes on early in spring for pasture, grows well in combination with legumes, makes high-quality hay, is easy to sow and germinates quickly with an almost sure stand?

The name of this wonder crop? Timothy. If it were not for its short life timothy, one of our oldest grasses, still would be our best all-round grass. Even with this fault, timothy still has a big role to play in Missouri's program of grass farming.

Timothy is more or less a neglected "stepchild" today. Newer grasses have received most attention—and more important, most of the fertilizer. In many cases, timothy has fallen into disfavor because it has been grown on worn-out land.

When timothy shares in a soil-building program its performance immediately perks up. For example, consider some test plots at old Sanborn Field at the Missouri Agricultural Experiment Station. Timothy is grown here in a common 6-year rotation of corn, oats, wheat, clover and 2 more years of timothy.

On one plot no soil treatment is made and last year the yield of timothy on a dry hay basis was 882 pounds to the acre. Actually, this was not all timothy. The plot was weedy and in the fall there was a thick stand of broom sedge.

On another plot manure is applied on the land—about 3 tons to the acre every year. This plot yielded 1,806 pounds of hay to the acre, had some broom sedge in fall.

But on a plot that "got the works" with heavy soil treatments, including extra applications of nitrogen, the timothy hay yielded

Reprinted by permission from Missouri Ruralist, Topeka, Kansas, July 14, 1951

13,314 pounds of dry hay. This plot made 2 cuttings in fact.

If your meadows are becoming infested with broom sedge don't be too quick to blame timothy for not growing as it should—maybe the timothy hasn't been getting a fair chance.

The story of timothy in Missouri is closely linked with the story of horse and mule power, for timothy was the No. 1 horse feed. During the depression days E. M. Woods, now with the Missouri Farm Bureau but then a county agent, had a theory that the nation's surplus of farm crops was brought on by the fact that with the decline of horses on the farm, all the land formerly growing timothy hay for horse feed was growing surplus grain crops.

It's impossible to check on acreages of timothy because figures compiled by agricultural statisticians do not list timothy as a separate crop—it's usually grown in combination with some other crop. The best A. C. Brittian, Missouri's agricultural statistician, can do is give acreages of timothy cut for hay. In 1925 this was 1,111,612 acres. In 1940 it was down to 581,249 acres. This latter figure is not quite complete, but indicates that timothy acreage was cut about in half.

With horses about gone from Missouri's farms, perhaps we have neglected timothy as a grass because we have thought of it as a horse feed. Of course, this is not true at all.

Timothy hay, when cut in its early stages, makes high-quality feed. Recently, we saw some bright green timothy hay on the dairy farm of W. H. Meyer, Hannibal. Mr. Meyer reported he considers good timothy hay fine feed for calves. It does not, of course, compare with rich legume hays for producing milk.

It's an old story that the protein content of hay drops quickly as hay matures. Yet, year after year harvest of timothy hay is delayed because of the press of other farm work. Perhaps this is because timothy hay still stands awaiting the sickle.

Even the mature, stemmy hay is well utilized by beef cows. Baxter Hall, Clarence, Missouri, harvested timothy for seed last year, then fed the remaining stems and blades to his beef cows and they did well thru the winter.

One enthusiastic timothy "fan" is Prof. Charles Helm, of the field crops department of the Missouri College of Agriculture. One point in favor of timothy emphasized by Professor Helm is the mechanics of seeding the grass—and this is important. Timothy seed is cheaper than most for one thing—currently it is selling for about $4.40 a hundred pounds. It is larger in size and thus easier to sow than most grass seeds. It will mix with clover seeds and stay

mixed. It germinates quickly and comes up readily—and this is quite an advantage. It's easy to sow in the fall.

For these reasons and others, Professor Helm believes timothy should not be overlooked in our grass system of farming.

Unfortunately, timothy has one great fault. It is a short-lived plant. Its usual span of good production is 3 or 4 years. In the new pasture improvement program in Missouri we are putting emphasis on more permanent pastures. With heavy fertilization of pastures it is hoped the life of these will be something more like 10 years. Thus timothy has been left out of many of these new seedings.

But for rotation meadows and pastures it becomes more and more apparent there's nothing wrong with timothy a good dose of soil fertility won't cure.

A Long-Drawn Question

Condensed from Foreign Agriculture

Dr. Lazar Volin
Regional Investigations Branch, OFAR

WHEN Kipling wrote the lines, *"His life is a long-drawn question, Between a crop and a crop,"* in the 1890's, he was thinking of the Indian peasant of that day. Unfortunately, he could just as well have been thinking of small farmers in many other underdeveloped countries. Even in our own times their lives are *"a long-drawn question between a crop and a crop."*

There are many reasons for the wretched condition of these small farmers, but a basic one is the system of land tenure under which they live. It is the feudal type of tenure that was once common in most of the civilized world and that persists in the Orient and some parts of Latin America and Europe.

Here, peasants constitute an overwhelming majority of the population. Land in these vast regions is the chief source of wealth, and—though there are marked exceptions—most of the peasants do not own the land they cultivate, are burdened by exorbitant rentals and usurious interest rates, and live close to the margin of subsistence.

Many leaders in these areas are keenly aware of the situation and eager to help improve it. The

Reprinted by permission from Foreign Agriculture, Washington, D. C., September 1951

United States has stated its clear intent to give all feasible assistance to democratic land reform measures. A high-level committee of the Government is continuing to study this problem. The question has also been made the subject of special investigation by a resolution adopted by the United Nations General Assembly last fall. The problem of land tenure in its relation to family farming also came to the fore at the Inter-American Conference on Agriculture at Montevideo last December.

Communism has endowed this challenge with a new urgency, for the rising tide of Communist propaganda has been adroitly exploiting the land question for its own ends.

The land tenure system, of course, has not been the sole factor responsible for the unhappy condition of the peasantry. "Too many people on too little land"; illiteracy; low productivity per unit of land and per man, often associated with shortage and prohibitive cost of capital and lack of the technical knowledge needed for the adoption of more progressive farm methods; inefficient marketing due to poor transportation and other causes—all have played their part. But land arrangements that are not in harmony with peasant aspirations have often been at the root of the agrarian difficulties. Certainly, they are nearly always the most provocative cause of the agrarian discontent and, therefore, potentially most explosive.

The undemocratic character of the prevailing land tenure system has not been seriously affected by the growth of nationalism and a transition in recent years of many underdeveloped countries from colonial status to national independence. This has been resented by the peasantry, for whom liberty (the motivating force of nationalism) and land are intertwined. Thus, the land problem has increasingly become a source of serious weakness, a sort of Achilles' heel in the social-economic structure of many of these countries, and it has easily lent itself to exploitation by Communist propaganda for its own political purposes.

The Communists have made valuable capital out of this situation. They have generously promised land to the small peasant cultivator and even fulfilled the promises on first seizure of power, before their regime was established. This was the case in Russia, Eastern Europe, North Korea, and China. The fact that the Communist ideology is hostile to small peasant farming and all private land ownership and would do away with them at the first opportunity, as it did in Russia and is doing today in Eastern European satellites, does not hurt

communism in the eyes of the land-hungry peasants. The Communist propaganda, which harps day in and day out on the necessity of abolishing the "feudal" landlord system and transferring the land to the tillers of the soil, naturally has a tremendous appeal to the poverty-stricken tenant peasantry.

The impact of Communist propaganda certainly has helped to convert the peasantry in many countries from being passively miserable to becoming alertly and actively miserable. Thus a grave threat has been posed to the social and political stability of many strategically vital parts of the world at a time of heightened international tensions, when internal stability is of utmost importance. The land tenure question, therefore has become of grave concern, not only to the various countries immediately involved but also to the United States and other countries of the free world, deeply interested as they are in the development of a solid, stable foundation for peace.

Fortunately, the lessons of history and contemporary experience, as well as the logic of the situation, indicate that in the contest with communism over the peasant and the land, the free world has in its arsenal weapons that are as effective as those of the Kremlin or even superior to them.

It is well to remember in this connection that undemocratic land tenure conditions have not always been peculiar to the countries where they prevail today nor have they proved historically to be rigidly unalterable. Until the late eighteenth and early nineteenth centuries, a large part of Europe was in a similar position.

For centuries the feudal manorial system of tenure by landlords, involving some form of bondage to the land by the cultivators of the soil, prevailed in Europe. The breakdown of this system and the disappearance of serfdom took place later in some countries and in others as a result of various political and economic conditions. England is the outstanding example of a country where the medieval feudal system of land tenure disappeared early. But it gave way largely to a tripartite structure of large estates, tenant farming, and endless farm labor—a system that left much to be desired. In recent history, however, the family farm has made marked headway in England. On the Continent of Europe a similar dissolution of the medieval feudal system began later, but out of it developed, in most countries, a class of small independent peasant farmer owners. One of the earliest examples is Denmark, where, in the middle of the eighteenth century, the Royal Government took measures for the protection of small peasant farmers. But, in gen-

eral, for the Continent of Europe the marked change in agrarian relations was ushered in by the French Revolution in the late eighteenth century and the ensuing Napoleonic wars.

As pointed out by Professor J. H. Claphan in his introduction to *Economic Development of France and Germany 1815–1914:*

"From 1500 to 1850 the great social question of the day in Europe was the peasant question." For this question the French Revolution had offered a solution which Napoleon endorsed. The revolutionary land settlement stood throughout the nineteenth century and stands today. . . . By example and the sword France had commended her settlement of the peasant question to her neighbours. She was not the first peasant country to attempt a final solution. Some of her smaller neighbours were before her. Some rulers of great states had made beginnings. . . . But her Revolution opened the last phase of the peasant problem in the West. From her revolutionary land settlement, through peasant emancipation in Prussia, to the emancipation of the Russian serfs, and even to the modern land legislation for Ireland, there is a continuous historic chain.

Now, what was the essence of this land settlement that largely stemmed from the French Revolution and the agrarian reforms inspired by it? It was a process that, in the words of another famous historian, Sir William Ashley, "transformed the peasants cultivating the soil from tenants into owners, on terms some times relatively liberal, some times relatively harsh."

There has thus occurred a wide diffusion of peasant family land proprietorship in Western Europe (though not to such an extent in Eastern Europe), based essentially on the principle of private enterprise and voluntary cooperation. It is a system of land tenure that still remains largely intact and has imparted to the Western European agrarian order a remarkable degree of stability. Thus, aside from southern Italy and Spain, the agrarian problem in Western Europe since the middle of the nineteenth century has been essentially no longer one of land tenure but one of prices and foreign competition.

It is highly significant that, except for France at the time of the Revolution, the solution of the land tenure question in Western Europe was achieved not by violence, though there were sporadic out-bursts in some countries, but by gradual reforms on the part of the governments concerned.

An outstanding example of such gradual land reform by legislation during the second half of the nineteenth century is Ireland,

which was transformed in the course of half a century from a country of destitute, discontented tenants to one of relatively prosperous small landholders. In that country, as in a number of others, alert governments were able to check much agrarian unrest and destitution by timely legislative action, reforming, in an orderly manner, the undemocratic system of land tenure more nearly in accord with the aspirations of the tillers of the soil for land ownership.

The study of the techniques developed in these reforms may provide useful lessons for countries that desire to reshape their land tenure systems. Particularly is this true for the usually difficult question of financial settlement. For, unlike the landlords under Soviet-style agrarian reform, the landlords in Western and Central Europe were compensated more or less liberally for the losses they suffered through the land tenure legislation. Incidentally, the fact should not be overlooked that the landlord's sacrifices, as a result of the land reforms, were undoubtedly much smaller than they would have been under a revolutionary settlement. For the advice of Czar Alexander II of Russia to the serf-owning Russian landowners that it is better to liberate the serfs from above than to wait until they liberate themselves expresses well the spirit of the whole land reform movement in Europe in the nineteenth century, which may be characterized as an attempt from above to forestall a revolution from below.

Some of the experiences in Russia are worthy of careful attention. That country made a promising step in the direction of land reform in the emancipation legislation and the land settlement of the 1860's. But the defects and inadequacies of the emancipation reforms, coupled with relatively slow economic and political progress, again created a crisis toward the end of the nineteenth century, which culminated in serious agrarian disturbances once the Russian autocracy was weakened by the disastrous Russo-Japanese War of 1904–05. The liberal elements of the Russian public pleaded for a new land reform in 1906–07, but the Czarist Government would have none of it. So, 10 years later, after the Russian autocracy was swept away in the wake of World War I, the new democratic Government under Kerensky also was faced with the question of land reform.

While the Kerensky Government favored an orderly land reform and set in motion the necessary preparatory work, it nevertheless was not quick enough, under the critical conditions prevailing in the summer of 1917, to forestall a peasant revolt. It thus played into the hands of Lenin

and his friends.

On seizing power in November 1917, the Bolsheviks actually gave the peasantry the green light to confiscate and divide the estates and to liquidate the landlords. They tried in this manner to win over the rebellious peasantry. Lenin, however, had made it abundantly clear earlier that an alliance with property-owning peasantry was likely to be of a temporary opportunistic nature. He remained, in true Marxist style, hostile to small peasant farming and insisted on the superiority of large-scale methods of production in agriculture as in industry. Eventually, as is well-known, Russian peasant agriculture was collectivized, but the appeasement of the peasantry in the early years of the Soviet regime, when it was still weak, undoubtedly helped to consolidate its power.

Russian experience thus provides an object lesson in the consequences of resisting or delaying an orderly land reform involving fair compensation of landlords. It also supplies the pattern of Communist agrarian policy that was followed with certain modifications in a number of other countries: first, propaganda in favor of expropriating the landlords and turning all land over to the tillers of the soil; second, apparent fulfillment of the promise on gaining power, when the new Communist regime, often based on coalition with other parties, is still weak; and third, breaking of the promise and eventual collectivization of peasant agriculture.

Land reform in the sense of creating a class of small land proprietors has never been, and cannot be expected to serve as, a panacea for all agrarian ills. In fact, the success of land reform in many countries of Western Europe was greatly helped by the general economic, social, and political progress that was characteristic of the century of relative peace between the Battle of Waterloo, in 1815, and the outbreak of World War I, in 1914. One needs only to mention the spread of education; the development of modern science and technology and their application to agriculture, with consequent greatly increased productivity per unit of land and per worker; the growth of industrialism and of modern means of transportation, with the accompanying expansion of the market for farm products; the drawing-off of the surplus population by migration to the cities or through overseas emigration; the growth of the voluntary cooperative movement; and extension work and other forms of governmental aid to agriculture.

These and other, often interrelated, factors played their part in transforming the fabric of Western agrarian society in such

a way as was probably never dreamed of by the ancestors of the modern Western farmers in the year, say, 1750. But land reforms provided a solid foundation for this progress in the nineteenth century, which, at the very minimum, in the words of a distinguished economic historian, "first reduced and then, it may fairly be said, removed the age-long dread of famine from the peasants and people of Western Europe." However, it should not be overlooked that problems raised by the fragmentation of the farm unit have by no means been solved in the West though promising steps have been taken by many countries. Another serious problem—advantageous use by small farmers of tractors and other expensive modern farm machinery—has also been partly solved by voluntary cooperative methods and governmental aid.

In the Orient, and in other underdeveloped areas also, land reforms, however urgently needed to provide the economic foundation for democracy, cannot be expected to be cure-alls. Without relief from oppressive taxation and usurious credit, and without rapidly increased productivity and more efficient marketing, the peasant small holder will hardly become his own master and certainly will not be able to raise his standard of living beyond the level of subsistence.

However, the fear that is sometimes expressed, that land reform in the underdeveloped countries would spell a disastrous decline of production, is largely unjustified. In most of these countries it is not necessary to split up into small, possibly uneconomic units, large and efficiently operated farms, as was done in parts of Europe. It is simply a matter of change in legal status, which would entitle the small farmer, who already cultivates the land as a tenant or a share cropper, to a larger share of the product of his labor and in the end would make it possible for him to become the owner of the land. Determined measures for reform of the existing system of land tenure not only would be of great significance politically, but in time would also have favorable economic effects because they would stimulate the personal interest of the tiller of the soil.

Here the Point Four program of technical assistance, which would help in providing the know-how to improve, where it is necessary, production and marketing practices and in teaching cooperative methods of dealing with farm credit and machinery, should strengthen the beneficial effects of land reform and tend to ward off any undesirable consequences.

Time Isn't Important To A Hog—But

Condensed from The Ohio Farmer

THERE'S an old saying that "time isn't important to a hog." That's probably true, but time is important to a hog feeder, especially when it comes to making money with today's high costs. You can't afford to spend too much time with your hogs—at least you can't afford to spend extra time at such jobs as carrying feed and water.

The cost of handling feed and water is a big item in hog production. These two jobs often take more than 40 per cent of the livestock labor. Feed may be handled as many as four times before it winds up in the hog feeder.

To produce 100 hogs, 50 tons of feed and 60 tons of water are condensed into 11 tons of live market hogs. That's a big job! But some farmers are taking the sweat out of it and producing better hogs at the same time. Experiment station studies show that water and feed handling costs can be shaved by two-thirds to an average of one man-hour of labor per hundred pounds of pork.

Livestock farmers can't afford to pump water by hand. If gravity flow water isn't available, mechanical pumping becomes a must. The water must be taken to the pigs, they can't run to water because of the parasite threat. On the average farm, 20 per cent of the hog work is spent in getting water to the hogs.

Because of their drinking habits, you know that hogs don't need a large amount of drinking space. All hogs needn't drink at one time, but clean, fresh water must be available when they need it. An automatic hog waterer is the best answer.

Hogs on pasture need a good water supply just as much as those in dry lot. If pastures are rotated, a well can be drilled near the center of the area and water piped to the field being pastured. Some farmers just lay pipes on top the ground and move them from field to field. Commercially-made automatic fountains mounted in the center of wooden platforms keep the area from becoming muddy.

Other farmers use a large capacity field tank with built-in float-type fountains. The tank can be pumped full from a field well as needed.

Another way is to invest in large capacity water hauling

Reprinted by permission from The Ohio Farmer,
Cleveland, Ohio, October 20, 1951

equipment. Mount a 400-gallon tank on a wagon and attach a durable hose to the outlet. Take the filled tank-wagon to the field when doing the feeding and fill the fountains. Or, mount the tank on skids or a sled. When two sled-mounted outfits are used, the full one can be left in the field and the empty one pulled back to the barn for refilling thus saving an extra trip.

Here's how the labor needs for watering systems stack up, according to Lowell S. Hardin of Purdue University. Let's assume we have 100 hogs in a pasture 80 rods from the farmstead for 140 days. A pressure system would require 15 hours of labor during the period. A shallow field well with large holding tank would take about the same amount of time. The tank-wagon method would take 36 hours and the use of two 100-gallon fountains pulled back and forth would take about 60 to 70 hours of labor.

The feeding work on several Indiana swine farms was surveyed recently. About 20 per cent of the hog work was in preparing, handling and distributing feed.

Feed, like water, should always be available. Large capacity feeders cut down the number of trips required for filling. Some farmers grind hog feed into a large auger-type self-unloading wagon. Then the wagon can be hauled around to refill the feeders, using an auxiliary motor or the tractor power take-off to do the unloading.

Sometimes ear corn can be fed directly from temporary cribs in the pasture. Hand shoveling can be reduced by dumping ear corn from a truck or scattering it with a manure spreader. Caution—waste in mud and dust can amount to 10 or 15 per cent.

A lot of time can be saved in feed preparation by hooking the corn sheller, grinder, mixer or hammermills up in combine.

Ground corn cobs make good bedding and provide sure footing for your livestock.

—*Meaty News*

Don't Put Up With Garlic

Condensed from The Farm Journal

INTO the hog trough goes milk tainted with garlic and with it most of the day's profits.

Or the grain buyer finds garlic in your wheat, and you take a dime per bushel dockage.

There's still no practical, one-shot treatment that will knock out wild garlic. But farmers are finding that 2,4-D will do the job if they spray with the right amounts at the right times.

Herbert Montgomery of Posey County, Indiana, had a terrific infestation. Parts of his field averaged 200 wild garlic plants per square yard. Montgomery seeded winter wheat, and sprayed with 2 pounds of 2,4-D per acre in early April, two years in succession. Result: he sold wheat without any dockage the third year.

Here's why you have to spray each spring for at least two, and usually three years. Wild garlic propagates itself in four different ways: by *soft-shelled,* below-ground bulbs; by *hard-shelled* below-ground bulbs; by aerial bulblets, and by small black seeds.

Many of the hard-shelled bulbs (and some of the seeds) live in the soil for two or three years before they germinate. The second and third sprayings kill these late-comers.

A good time to spray is early spring. The idea is to kill the plants before they have a chance to slough off six or seven little bulbs.

Cultivation kills garlic too; and a rotation that permits you to *both* spray and cultivate during the season is better than 2,4-D alone. Here's a system that works well with a corn-soybean-wheat-legume rotation in Indiana:

Spray in early April, then plow and plant corn on the normal planting date. The second year, spray in early April; then put in your soybean crop. After you've combined the soybeans in the fall, spray again. Wait a few days for the 2,4-D to take effect, then work up the ground and seed your wheat.

Use 2 to 3 pounds of the ester or amine form of 2,4-D in 5 to 10 gallons of water per acre at each spraying.

Ridding pastures of garlic is a tougher problem, since legumes can't take much 2,4-D. If you've got a lot of garlic, your best bet may be to spray and grow cultivated crops until the weed is cleaned out. Then you can seed the land back to a legume-grass

Reprinted by permission from The Farm Journal, Philadelphia, Pennsylvania

mixture again.

If you have permanent pasture on land that's too steep to plow and cultivate, spray with 2,4-D in late winter or early spring—before the legumes start to grow. Some of the dormant legume plants will be damaged, but most of them will recover.

Pennsylvania State College recommends 1 pound of the ester form per acre each spring for three years. "Many Pennsylvania farmers have gotten excellent kills with this treatment during the last two seasons," reports Agronomist S. M. Raleigh.

A good way to clean up ladino and grass pastures in North Carolina, say State College agronomists, is to mow two or three times (or graze closely) during the winter, then spray with 1 pound of the ester or amine form of 2,4-D per acre in early March. The ladino is severely damaged by the 2,4-D, but recovers in three or four weeks. Infested pastures usually require three years of such treatment.

A New Market For Milk

Condensed from American Agriculturist

James Hall

THE relatively new milk vending machines are proof that consumers will buy good food when it is available. Cornell University School of Nutrition, under the leadership of Director L. A. Maynard, placed 5 milk vending machines on the University campus about a year ago, and these machines are dispensing as much as 15,000 half pints of milk a month. This is all extra consumption because the School has checked the regular eating places and cafeterias on the campus and found that there has been no decline in the sale of milk at regular meal hours. The milk vending machine studies, reported in a recent School of Nutrition bulletin, were part of the School's program of studying ways to better human nutrition.

A dairy company has put 16 machines on the Michigan University campus and is currently selling the equivalent of 10,000 quarts of milk a month, without cutting into the normal sales. A Rochester dairy has a battery of these automatic cows located in various plants and office buildings, and has found that American factory and office workers welcome the chance to drink milk when it is available. The machines are

Reprinted by permission from American Agriculturist, Ithaca, New York, October 20, 1951

all operating on a profitable basis.

Few of us have ever thought of a gasoline station as an outlet for milk, but last summer an enterprising concern put two vending machines in a filling station on the northbound side of Connecticut's main highway, the Merritt Parkway, and two on the southbound side. Milk was dispensed in half pint cardboard cartons and, despite the fact that the operators were charging 15¢ apiece (60¢ a quart), these four filling stations sold 3,200 units in one 48-hour weekend.

In New York City a milk distributing company has installed in apartment buildings a machine that dispenses quart bottles. They do not release figures on their sales, but the operation is profitable, and it is easy to see why. Many of the apartment house dwellers in New York get their milk at the corner store on the way home from work. It certainly is much more convenient to step into the basement of the apartment house, drop a quarter in the slot and get out a quart of milk and 7 or 8 cents change.

Milk vending machines are of many types, including those that dispense the milk in glass, but the most modern of the enclosed refrigerated machines dispenses the milk in cardboard cartons in various sizes, including half pints, ⅔ pints, and quarts.

The Rowe Manufacturing Company, a New Jersey concern, and one of the pioneers in automatic vending machines, is making machines for milk, and they have it figured out that in order for a machine to make a profit, it should be located at a place where 300 people have daily access to it, because 25% of them will make a purchase, and 75 sales a day is profitable. However, they have found out that in certain industries where there is dust or peculiar odors, there is a much greater demand for milk. That kind of a location consequently takes fewer people to warrant the installation of the machine. The same company says that a man going into the vending machine business should have at least 12 machines placed so that there is not too much driving between them for the serviceman.

While the man with the machines buys his milk delivered to the machines by a regular dairy, he still has to stop at each machine every other day just to make sure that it is spotlessly clean on the outside and that no milk has been spilled that will create a sour condition on the inside. We have been told that a man who has 12 machines and good locations and who is willing to work more than the usual 8 hours a day can make somewhere around $9,000 or $10,000 a year, less his traveling expenses.

The milk vending machines are

creating new independently-owned businesses, but more important than that, they are making available to many more people one of the most healthful, nutritious foods that can be purchased, and at the same time they are creating a brand new market for the products of our dairy farmers.

The Cornell School of Nutrition, pioneer in the research of practical use of the machines, put one in the McLean Central School which had no cafeteria or school lunch facilities for its 200 students, and the youngsters drank 150 units a day. The same machine moved later to a boy scout camp and sold 100 units a day to 125 boys and staff members, even though the boys had all the milk they wanted with their meals. At a Campfire girls camp with 90 girls, a large percentage again bought milk with the machine dispensing 62 units a day.

It seems to me that the machines are beneficial to everyone. The farmer has to produce more milk, which is sold to the fluid market, and the milkman has to make more deliveries, but this time to a machine instead of a front doorstep, and more and more people gain by its nutritive qualities, in many cases the milk replacing carbonated drinks.

And this isn't all that is in the offing as far as making good food readily available to consumers is concerned. Already there are trial machines dispensing such things as ice cream, eggs and cottage cheese, and I understand that there is at least one rather huge contraption that dispenses milk, eggs, butter, cottage cheese and other dairy products all from the one machine.

Some of the experimental dispensing machines were rather intricate, due to the need for being refrigerated and of a capacity big enough to last from one trip by the milkman to the next. Further complications arose when defective glass bottles broke when dropped a foot or more when the coin was inserted. The cardboard type containers have pretty well taken care of the breakage problem, but because they are not reusable, they represent quite a storage problem, to dairymen dispensing several thousand a day. Several firms are making and constantly striving to improve folding type cartons that will still work properly in the vending machines. When this type is perfected at a low enough price, milk handlers will be able to store hundreds in the same space occupied by a few of the non-collapsible type.

Machines are selling extra fluid milk where it was never sold before.

Flood Control Program

Condensed from Soil Conservation

Hugh Bennett
Chief, Soil Conservation Service

IT IS a real inspiration to me as a soil conservationist to meet with you newspaper editors assembled here in Lincoln to consider the critical problem of flood control. It is a significant milestone, I think, in the Nation's march toward preserving its basic soil and water resources, when several hundred busy editors come together on their own initiative and at their own expense to discuss ways of achieving sound and effective flood control in this breadbasket of the Nation.

The recent flood catastrophe in Kansas and neighboring States has once more focused attention on the urgent need for doing the best we know how to prevent the recurrence of disastrous floods which every year somewhere in this area, as well as in other parts of this country, tear down with great destructiveness across productive farm land and through prosperous towns and cities.

What can be done—what must be done—to prevent the staggering losses in crops, in property, and even in human life depends in large degree on the determination and efforts of you people who are in this audience today.

Some among you may feel that we cannot afford the cost of flood control in these times of national emergency. As a civil servant, I did not come here to tell you what the Nation's policy should be in this regard. That is for you, the people, to say. But there are some things I can tell you.

First, we hope that neither we nor our children will live to see another catastrophe like this last flood. But, unfortunately, we can be certain that costly floods in all probability will strike again next year, and the next—somewhere in Nebraska, Iowa, Kansas, Missouri, or other parts of the Nation.

Secondly, I can tell you that it is possible to control these floods. It is possible to eliminate almost completely the smaller and more localized floods, and it is practicable also to reduce greatly the damages from tremendous rainstorms that cause super floods like this last one.

No single method of flood control, however, will do the whole job. We have seen in this great

Reprinted by permission from Soil Conservation,
Washington, D. C., November 1951

flood, for example, how levees high enough to have withstood the largest previous floods on record were overtopped. On the other hand, we have also seen how the soils of our fields and pasture lands became so saturated with water after 2 months of heavy rains that they could absorb very little more from the final big rain. To meet all kinds of flood conditions, and to prevent or minimize flood damages wherever they occur, we must use every available method of control that we know about.

We must develop a sound, coordinated plan for every watershed to assure a properly balanced and truly effective attack directed toward prevention of flood damages. The day of piecemeal flood control—where only a part of the damage in a watershed is considered—is rapidly drawing to a close.

Our efforts to control floods must begin where the rain strikes the ground. Every additional gallon of water that we can get into the soil by improving its intake capacity with conservation measures means 1 gallon less contributed to the flood flow. Let no one mislead you into believing that it is ever impossible to get more of the rain into the soil. No matter how much rain has already fallen, we have yet to find a soil on sloping land that does not have some water-holding capacity left. In other words, a soil is never completely saturated unless it is below the ground-water table, as in a swamp. Water will still go in along roots, and will penetrate through cracks in the ice of so-called "frozen soil." It is true that when the soil is comparatively dry it can take up many times as much water as it can after prolonged rains. But it is also a mathematical certainty that the soil can always take up some more water. Therefore, our first step in flood prevention, under all conditions, is to put the soil, as far as practicable, in a condition conducive to optimum water intake.

What excess water does run off the fields into the drainageways, we must slow down with small retarding structures and with other improvements in the watercourses. And what flows out of the creeks we will have to handle in the main river valleys by more imposing measures—engineering measures such as reservoirs and levees.

Our job of flood control, then, begins where the raindrop falls and it does not end until the water reaches the ocean.

The important problem now confronting all of us is to determine, in cooperation with each other, what kinds and combinations of measures are needed, watershed by watershed, to accomplish the most effective flood control we can afford. In doing so we must, of course, bear in mind

our continuing need for irrigation storage, for power production, for municipal water supply, for pollution abatement, for preserving fish and wildlife resources, and especially the need for maintaining maximum agricultural production on fertile valley lands. Our watershed plans must provide not only for the control of floodwaters, but also for their conservation for beneficial use. In this connection, let us bear in mind that the limited number of available sites for larger reservoirs should, wherever possible, be considered with respect to multiple land and water needs before they are dedicated solely to flood control.

There are several reasons why sound and enduring flood control, aimed to benefit all the people, can be achieved only through a coordinated attack. The first of these reasons is apparent from the distribution of flood damages. Although some engineers may dispute what I say—and might even quote Webster against me—I submit that flood damages begin where the rain falls, regardless of what Webster may have thought about it. The crops on upland farms that are swept down by storms which cause great floods are just as truly lost as the crops on overflowed land in the valleys below. The soil washed off upland fields reduces the productivity of the land just as much as does deposition of soil by the water flooding over agricultural bottom lands along the rivers. Floodwater damages to agricultural lands in thousands of miles of small creek bottoms throughout our watersheds represent just as much loss per acre as flooding of the wide Missouri River Valley between Kansas City and St. Louis.

The Soil Conservation Service has just completed a preliminary survey of the storm and flood damages in Kansas and Nebraska during July. This is what we found: Losses of crops on upland farms amounted to approximately $110,000,000. Losses of irreplaceable topsoil, the thin and fertile layer that sustains agriculture in this granary of the Nation, has been estimated at $200,000,000. This figure is based on the differences we have found in crop yields with different depths of topsoil. Losses from floodwater and sediment in the creek bottoms and small stream valleys, above the points where anyone has yet proposed specific flood-protection measures, were estimated at $102,000,000. The total of these three figures is $412,000,000. Additional losses in Missouri, Oklahoma, Iowa, Illinois, and other neighboring States would bring the total probably to well over a half billion dollars in the one month of July.

Without in any way minimizing the staggering losses at Kansas City and along the major river valleys, we believe that these

astounding damages along the tributaries are convincing evidence that a flood-control program aimed only at downstream cities and river bottoms is only a partial flood-control program and not one designed to benefit all the people who have suffered losses.

Let me give you another reason why this country needs a coordinated and complete flood-control program extending to every acre all the way down to the sea. To be sure, super floods like this last one are comparatively rare events. I am told that the flood discharge at Kansas City far exceded the highest ever previously experienced, which was back in 1844. When an event exceeds all previous expectations and wreaks such havoc, it not only makes banner headlines, but it becomes an historic classic. It gets into our memories and textbooks. People come to look on it as characteristic rather than something rare—or unique. Actually, if one spreads the enormous damage caused by this flood over all the years between such rare events, the average annual loss is considerably less than the damages from all the smaller local floods that occur year after year in the smaller watersheds throughout Kansas, Nebraska, Missouri, Oklahoma, Iowa, and Illinois. A typical example of the smaller, more frequent floods has occurred here on Salt Creek these last 2 years. You local people are only too familiar with this kind of flood.

Our surveys show that 75 percent of our average annual flood loss has occurred above the main river valleys and large cities. This, of course, is due in no small measure to the fact that a substantial part of our major river flood plains and cities are already protected by levees and major reservoirs, for which credit is due primarily to the effective work of the Army's Corps of Engineers.

I can give you still other reasons why a coordinated approach to flood control is essential. Soil erosion on watershed lands must be brought under control to protect downstream flood-control works. We must control erosion to protect our flood-control reservoirs from rapid silting and loss of effectiveness. We must control erosion to prevent the silting of stream channels, which further reduces their flood-containing capacity. We must control erosion, moreover, to prevent overwash of infertile sand and poor subsoil material on our productive bottom lands. But even more important than all of these, we must control soil erosion if we are to maintain the base for our agriculture, our national strength and defense, and, indeed, to prevent our civilization going the way of many great nations of the past which failed to take care of their agricultural land.

So that there may be no mistake about where we stand in the Soil Conservation Service, let me reaffirm:

1. That we believe, and our widely multiplied experience confirms, that flood control is a job which begins where the rains fall and the runoff starts—that is, in the fields and pastures and forests, and ends only when the runoff has safely reached the ocean.

2. That we believe wholeheartedly in coordinated planning and treatment of entire watersheds and drainage basins in cooperation with the Army Corps of Engineers, with soil conservation districts, with watershed associations, and with all other Federal, State, and local agencies that have a responsibility in land and water management.

3. That the work of the Soil Conservation Service is in the fields and pastures and wood lots and on the upstream tributaries of the major rivers. Our job is first to assist landowners and operators to use their land within its capability, and to treat it with sound conservation practices in accordance with its needs. Beyond this, our job is to assist organizations of local people to install upstream flood-prevention measures, such as small retarding structures, gully plugs, and channel improvements. If, through such a program, we can cause the water which falls on the lands in the upper watersheds, or even a considerable part of it, to delay its race to the sea, we have by that action won part of our objective—completed part of the job of flood control.

But this kind of program alone will not prevent flooding of the main river valleys and the cities in them.

4. We believe that coordination of the river-control and watershed programs was the intent of Congress when it passed the Flood Control Act of 1936. We believe it is still the intent of Congress. We do not believe that Congress intended one program to be in any sense a substitute for the other, but rather that they should be complementary parts of a single job.

The Flood Control Act of 1936 and subsequent acts provide all the authority needed by the Department of Agriculture and the Corps of Engineers to work together in planning and carrying out a complete program for alleviating flood damages and conserving soil and water resources. Such watershed and river-basin plans for flood control, as we see it, involve three principal types of operations, namely:

(1) *Land treatment.* Our conservation farm and ranch planning is based on the principle of treating every acre of land according to its needs, and using each acre according to its cap-

abilities (that is, for cultivated crops, grass, timber, or wildlife). It also includes safe and orderly disposal of runoff water originating on the farm or ranch. Land treatment measures prevent erosion, maintain soil fertility, conserve water by storing it in the soil, prevent damage on the farm from the erosive action of rainfall and runoff, and reduce the sediment loads of creeks and rivers. Land-treatment measures are now being rapidly installed by landowners throughout this area—as well as other areas—under the programs of the locally organized soil conservation districts, aided by technical assistance from the Soil Conservation Service and by other forms of assistance, such as educational and financial. We have ample authority for this part of the program, but funds available for technical assistance fall far short of the need, if we expect to achieve substantial flood protection in the next 10 or 15 years.

(2) *Upstream engineering* for water-flow retardation and channel stabilization. This phase of the watershed plan involves work on the tributaries and waterways to control or retard runoff from neighboring farms. These measures alleviate damage to the agriculture of the smaller watersheds above the downstream engineering works. They slow runoff and stabilize sources of sediment in upstream channels.

We are doing these things now just as rapidly as our facilities permit. They represent water-control operations over and above what is ordinarily done through the farm-land conservation job.

(3) *Downstream engineering* for flood control. This comprises the work done on the major waterways to control runoff after it has reached the main stream. It alleviates urban damages and damage to agriculture in the flood plains lower down the major rivers. This major engineering is the responsibility of the Corps of Engineers.

There you have, as we understand it, a coordinated approach to flood prevention and control—a program that protects the farmer or rancher of the uplands as well as of the lowlands, while protecting the cities, too.

Congress has so far authorized watershed programs, including land treatment and upstream enginering, on 11 watersheds in different parts of the country. Many of you no doubt are acquainted with the work under way on the Little Sioux watershed of northwestern Iowa, and the Washita River of Oklahoma. We are carrying out the works of improvement in these two flood-control projects—as in the other nine—primarily through the farmers' soil conservation districts. In all instances our work is

coordinated with the authorized work of the Army Engineers farther downstream.

We need go no farther than the city limits of Lincoln—into the Salt-Wahoo watershed—to find what is to my mind a splendid example of the coordinated watershed approach to flood control. Here is a striking illustration of effective community cooperation, including the Salt-Wahoo Watershed Association, which is made up of city people and farmers in soil conservation districts; the Soil Conservation Service; the Army Engineers; and other local, State, and Federal agencies.

Joint studies of this watershed are being made now by our Service and the Army Engineers under authority of the Flood Control Act of 1936. We hope that this study will lead to authorization of a coordinated program for flood control in this area similar to that already authorized in the 11 other watersheds mentioned. I think the soundness of this cooperative approach was well stated in the progress report on the joint watershed survey made by the Army Engineers and Soil Conservation Service. The report pointed out that the two agencies had one objective in this study —that is, to prepare an over-all plan for the entire watershed which, quoting from the report, "will represent from the standpoint of both agencies the best plan for the basin as a whole which is practicable within the limits of economic feasibility, and one which both agencies can recommend and support without reservation."

"Both agencies feel," the report added, "that this objective can best be realized by a joint study which will produce a single plan mutually developed by both agencies rather than a compromise between two individual plans developed by the two agencies acting independently."

The Salt-Wahoo undertaking also illustrates the importance and effectiveness of local group action in watershed planning and development. Here, as elsewhere, the local soil conservation districts are taking an important part in the permanent watershed program. As the principle organization through which soil and water conservation measures are being applied to the land by individual farmers the country over, it is only logical that these districts also should be called on to serve directly in such flood-control activities in the public interest.

By the same token, the Salt-Wahoo situation shows why there is a place for an advisory group, committee, or association like the Salt-Wahoo Watershed Association, which brings together the interests of farmers and city people. In other words, for a

watershed-development program to operate successfully—in Nebraska, in Kansas, or anywhere else—the basic responsibility for that program must involve the people residing in the watershed. That means there must be a local responsible organization such as a soil conservation district, watershed association, or flood-control district, which is representative of all the interests in the watershed and which can act to coordinate the activities and services of all agencies and interests to formulate the necessary broad, flexible program for watershed development and protection.

We have found that the most efficient way of carrying the soil and water conservation job beyond the planning stage anywhere is through coordinated group action of the landowners and operators—with technical and other assistance from other sources. Group action is especially effective, and necessary, in dealing with problems of watershed extent. Soil conservation districts themselves, of course, are basically group-action devices; and their efficiency and success in this direction have been proved by their rapid organization and growth. In only 14 years, approximately 2,350 such districts have been formed in the 48 states, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. They now include more than four-fifths of the farms and ranches in the United States and three-fourths of the country's farm land. Fortunately, the area you editors represent is largely within soil conservation districts. Nebraska, for example, is one of 10 States completely covered by soil conservation districts. Kansas is not far behind with more than 99 percent of its area in districts; while Iowa is 95½ percent covered. If your county doesn't yet have a district, I recommend that you urge the local people to organize one.

Let me emphasize, however, that planning and application of the watershed program requires special technical skills. Downstream, as you know, the highest order of engineering skill is necessary for building big dams, main-channel stabilization works, and so on. Also, in the uplands technical know-how is required to plan and apply sound land treatment and upstream engineering measures. Such plans must be based on painstaking research and on wide practical experience. They must take into account the principles of hydrology, engineering, agronomy, land science, forestry, biology, and other related fields. Under varying conditions of climate, topography, and drainage, the wrong thing done, or the right thing left undone, on any part of a farm can do serious injury.

In no event can this watershed

planning and treatment be accomplished overnight by some magic formula, although it takes heavy rains and excessive runoff only a few days, or even hours, to do irreparable damage to watershed land and property. Our conservation land-treatment and upstream-engineering activities are based, in the first place, on detailed land-capability surveys. They show, acre by acre, the needs and capabilities of the land in relation to combinations of such factors as soil, slope, rainfall, erosion, and so on. Our watershed plans involve the location of sites for small floodwater retarding structures, water-disposal systems, gully-control structures, stream-bank stabilization, and other upstream-engineering measures.

Our Soil Conservation Service technicians work out on the land cooperatively with farmers, covering entire farms, acre by acre, and field by field. We cannot depend on windshield surveys and office planning in doing a job of the complexity and magnitude of safeguarding the farm lands of the Nation. Nor can we have a ready-made plan including a fixed set of practices to slap on any farm of watershed. Land, and the behavior of the water that falls on the land, differs from watershed to watershed, from farm to farm, and from acre to acre. So every watershed and each parcel of land must be dealt with individually.

That, briefly, is how we go about the treatment of agricultural land for effective soil conservation and flood control. We have developed a unique combination of soil conservation, engineering, and vegetative practices designed to dispose of surplus water safely while making the best practical use of the water that otherwise would be wasted. For the first time in history, we are going into the small watersheds to do everything possible to provide relief from recurring flood damages.

Splendid examples of the effectiveness of tributary stream flood control can be cited from the experience of the Soil Conservation Service.

On May 16, this year, Sandstone Creek with a watershed of 65,000 acres, southeast of Cheyenne, Oklahoma, had 4½ inches of rainfall. The watershed had been treated for soil conservation and flood control. The runoff water did not even come up to the draw-down pipes in the retarding dams. None of the permanent pools were filled. Sandstone Creek, which had been noted for its flooding, contributed practically no flow to the Washita River, while other similar creeks of the locality were flooding and doing great damage.

Farther west, near Clinton,

during the same wet period, the Barnitz Creek watershed received about 13 inches of rain within 24 hours. Within its watershed of 4,000 acres four detention structures had been built and the usual surface treatment of terracing, regrassing, contouring, and the like had been completed. The creek stayed within its banks while similar neighboring creeks did great damage with this same precipitation.

Rates of silting have been measured two or three times in some reservoirs—first, before any conservation work was done on their watersheds and again after a substantial part of the needed conservation measures had been applied. Treatment of about 30 percent of the watershed resulted in a 24-percent reduction in the silting rate of the municipal reservoir at High Point, N. C.

In contrast, it was found that more intensive use of land for row crops and lack of conservation measures caused an increase of 20 percent in the silting rate of the water-supply reservior at Decatur, Illinois.

In conclusion, let me assure you that with whatever resources we are provided the Soil Conservation Service will continue to work toward sound soil conservation, wise land use, and protection of the Nation's water resources as well as its land. We will do this in cooperation with local, State, and Federal agencies, or with any other organizations and groups which have like objectives. In working toward the permanent solution of our water problems, the Service will continue to give full consideration to all beneficial water uses, including those for recreation and wildlife. Also, the Service will continue to encourage conservation districts and other conservation organizations to use, to the fullest extent practicable, all available assistance from public and private sources.

Our men throughout the field are acquainted with the principles I have mentioned and I am sure you may count on their living up to them to the fullest possible extent. We will actively cooperate with soil conservation districts and other similar groups. This, together with the positive support of agencies and community leaders like those represented here, who are in a position to help, will expedite the conservation program throughout the country.

We have the knowledge of how to do the job; the conservation tools have been perfected and tested; we have an organization equipped not only with the necessary technical skills, but with the knowledge and understanding to work with local people—individual farmers, community groups, organized districts and associa-

tions, city people, and industries as well. As a Nation we have no excuse for not doing the job of conserving our basic soil and water resources; indeed we dare not shirk it, because our individual and national security, peace, and prosperity depend on it.

Heat Lamps In Brooding Chicks

Condensed from Rural Electrification News

THOUSANDS OF FARMERS throughout the country are brooding chicks with radiant energy, using heat, or infrared, lamps. Many farmers are enthusiastic; others have had trouble. As with any new method, the farmer must learn how to use it.

First, it is well to know what a heat lamp is and how it heats.

Heat lamps give off infrared or radiant energy, which is familiar to everyone although it may not be recognized by that name. The sun's heat, for instance, is radiant energy. On a day when the sun is shining brightly a person is much warmer when he is in the sun than when he is in the shade, even though the air temperature is the same in both places. Both light and radiant heat pass through the air without heating it—only the floating particles of dust in the air are heated.

Part of the energy given off by heat lamps is ordinary visible light. Most of it is infrared rays or radiant heat. When energy rays strike a chick, the chick absorbs most of them and is warmed, even though the surrounding air may be cold.

Actually, heat lamps and the usual incandescent lighting lamps are quite similar. The important differences are that the more common heat lamps are larger than most of the usual lighting lamps, they give off less visible light in proportion to the amount of electricity they use, they last much longer, some of them have a special glass which is less likely to break if water is splashed on it while the lamps are hot, and most heat lamps have built-in reflectors for directing the energy.

Arrangement of the lamps and the number used is important in an infrared brooder installation. One of the most common arrangements is to separate chicks into groups of not more than 500 each and to provide a battery of six 250-watt heat lamps for each group. This is about 3 watts for each chick. In very cold weather up to 6 watts per chick may be needed. In case of disease in the flock, even more heat may be required to keep the chicks comfortable, as chickens with disease

Reprinted by permission from Rural Electrification News, Washington, D. C., Oct-Nov 1951

eat less and are not active.

In a 6-lamp battery, the lamps are placed in pairs about 30 inches apart. This makes two rows of lamps about 5 feet long. In each pair, the lamps shine downward with an angle of 40° to 45° between them. In some circumstances, more lamps may be needed in each 5-foot battery, or the batteries may be shortened by placing the pairs closer together with fewer chicks under each battery. The extra lamps may be turned on only when they are needed.

At the beginning of the brooding period the lamps are hung about 18 inches above the litter. As the brooding period progresses the lamps are raised and individual lamps in each pair may be cut off to reduce heat.

With heat lamp brooding, it is essential that drafts be eliminated. For the first week and sometimes longer it is necessary to have a baffle around each group of chicks, even in a tight house. This baffle may be cardboard, sheet metal, or any other similarly *tight* material. It should be from 15 to 18 inches high. Usually, the baffle can be removed after the first week. By that time each chick will have learned his "home" brooder and there will be no tendency for all of the chicks in the house to crowd under one or two of the batteries. The baffle must be removed when the chicks begin to fly over it.

Since it is well known that chicks need less heat as they get older, it is important to control the heat from the lamps, either by hand or automatically. There are three methods for controlling the heat—by varying the voltage of the lamp, by turning lamps off and on, and by raising and lowering the lamps.

Equipment to vary the voltage of the lamps is still expensive. So far, it has been manufactured only for industrial use. Until less expensive equipment is developed this method of controlling heat lamps in brooding will be practical only with exceedingly large flocks.

If lamps are turned off or turned on as a means of controlling heat, it is important that several lamps shine on the same floor area so that turning off one or more lamps will reduce the amount of radiant energy falling on the area. *Unless the lamps shine on the same floor area, turning some of them off will merely reduce the size of the heated area* and leave unchanged the degree of heat a chick in the heated area would receive.

Raising and lowering lamps also controls the amount of heat. As a lamp is raised, it spreads its energy over a wider area and the heat produced is less intense at any particular spot. Enough lamps will have to be used so that on cold days, when the lamps are

lowered and the size of the heated area reduced, the heated area will be large enough for all of the chicks being brooded. On warm days, the heated area will be larger than is necessary.

Suitable automatic equipment for turning individual lamps off and on is available, but the cost of this equipment in most cases may not be justified, particularly with farm flocks.

For most farmers the soundest recommendation at present is to forget all automatic controls and turn individual lamps on and off and raise and lower them by hand. A poultryman can tell when he has the right adjustment by watching the chicks. If they shun the heated area, there is too much heat. If they pile up in the center of the heated area or behind some barrier that protects them from air movement, they are too cold.

However, when a thermostat is used to control a voltage regulator or a device to turn off and on certain lamps, it should be placed outside the heated area. Some poultrymen have made the mistake of placing the thermostats in the heated areas as they do with other types of brooding. Direct rays from the lamps heat the thermostats above the air temperature, so that they reflect neither the air temperature nor the comfort of the chicks.

Research people have not yet determined how much radiant energy chicks need to receive as their surroundings get colder. The rate that chicks radiate energy to things around them under different conditions has also not been established. Until these facts are known, a farmer who uses automatic controls will need to spend considerable time with his flock during the first brooding system—adjusting the lamps and controls so that the chicks are comfortable over the range of temperatures that will be present in the brooder house.

Another problem which has not yet been completely solved is that of ventilating the brooder house when heat lamp brooding is used. This problem may not be serious when small numbers of chicks are brooded for replacement of the usual farm laying flock. It may become serious when 1,000 or more chicks are brooded in one room.

With heat lamp brooding, present experience indicates that the brooder house walls should be tight and a ventilating fan blowing outward should be placed near the ceiling at the highest place in the room. In large rooms, more than one outlet fan may be needed. It may be necessary, to provide inlet fans directly opposite the outlet fans. If this is necessary, they should be arranged so that the air movement is across the ceiling with no drafts on the floor.

By using heat lamps, a farmer

can build a satisfactory brooder rather cheaply. However, the cost for electricity will be more than for the usual hover-type electric brooders. In brooding small numbers of chicks this difference in operating costs will not be enough to be important; with large flocks it may be significant.

There is probably more need for an automatic alarm to warn the farmer that the current is off when he uses infrared brooding. With the usual hover-type brooders, much of the heat is held under the canopy of the brooder. The chicks themselves give off heat which is retained under the hover. The current might be off for a considerable time without the chicks becoming chilled. With heat lamp brooding, there is no hover and the chicks and litter cool off quickly.

In spite of the fact that there are still many unsolved problems in heat lamp brooding, it is being used successfully in all parts of the country. Experts list several advantages, including:

1. The absence of a hover allows fresh air and light to reach the chicks, and reduces the parasite problem. It is easier to see how the chicks are developing and to detect sick chicks more readily.

2. Without the hover, the brooding equipment is more easily moved out of the way and there is less work in cleaning. Storage of brooding equipment requires less space.

3. Some reports indicate that the chicks get more exercise and eat more food, with a corresponding increase in weight and development.

4. The litter under the lamps remains dry.

5. There is less tendency for the chicks to pile up.

6. Lamps over the roosts train the chicks to use roosts at an early age.

7. The initial investment is less than for any other type of brooder of equal capacity.

Some of the disadvantages are:

1. Suitable automatic heat controls are not yet available. The operator may have to do some experimenting to learn how much to raise and lower the lamps or when to turn lamps off to control the heat.

2. There may be excessive moisture condensation on the walls and ceiling and in the litter not under lamps.

3. Different methods of ventilating the brooder house are needed from those used with conventional brooding and the best methods have not yet been determined.

4. There is more need for an off-current alarm, and a lengthy outage may be more serious.

5. In case of diseases, when considerably more than normal amounts of heat are needed to help the chicks recover, the installation may not have facilities

for the extra lamps needed.

6. Drafts in the brooder house are more serious.

7. The amount of radiant heat needed and the best lamp arrangement for all different conditions have not yet been determined.

8. Chicks are in the light continuously and therefore do not know darkness. In case of an outage at night, there may be excessive fright at night with its attendant damage, even though the chicks are not chilled.

9. The cost per chick for electricity will be higher than for hover-type brooders.

Good News For Corn Growers

European corn borers by the billions are dead or dying in large areas of the country because of a parasitic fly. USDA entomologists say 40 to 60 percent of the borers are being killed by such flies in many places in the Corn Belt, and that the parasites are spread now over most of the heavily-infested parts of the country. The fly, called Lydella, looks much like the common housefly but is somewhat larger, narrower, and has longer legs. Its use for corn borer control is the result of three decades of research by USDA entomologists to find a natural enemy of the corn borer, and it appears to have been a substantial factor in the reduction of corn borer losses during the past two growing seasons. The females search for frass (droppings of the borers) at the entrances of the borer's tunnels in corn stalks. They deposit their maggots on the frass, the maggots then enter the tunnels, seek out the borers, and kill them by devouring their insides. Only within the past two years have the scientists plans for biological warfare between the borers and their parasites materialized. Damage by borers in 1951 has not yet been determined, but the entomologists expect that it will be materially less than the estimated $85,000,000 loss in 1950. What percentage of this reduction in loss can be attributed to the fly parasites is not possible to estimate at this time, if ever. The scientists say it is obvious that the beneficial effect of the flies has been considerable.

—Meaty News

Yard Lighting For The Farm

Condensed from The Southern Planter

J. L. Calhoun

Virginia Polytechnic Institute

FOR a few pennies a month for electricity, you can enjoy the benefits of yard lighting. Only a small amount of light is needed —just enough so objects can be seen and distinguished at night. This type of farm lighting has many advantages. It is convenient; it aids in doing the winter chores; it helps prevent accidents when walking around the farmstead at night; it discourages thieves and prowlers.

Then, too, outside lighting extends a warm welcome to visitors.

The number of yard lights needed depends upon the size of the farmstead and the building arrangement. Several types of fixtures and lamp bulbs are available for this purpose.

Bracket Light. This fixture is made especially for outside use. It consists of a reflector, socket and bulb which are supported by a short piece of conduit. You can mount this unit on a pole or on the side of a building. The reflector should be of the shallow dome type to permit a wide spread of light. Select a unit that is durable and waterproof.

A bracket light is recommended for lighting a circular area. One of these fixtures with a shallow dome reflector 16 inches in diameter and a 300-watt lamp bulb will give enough light within 200 feet of the unit. In other words, it is adequate for an area about 400 feet in diameter.

Projector Lamp Bulb. This lamp, sometimes called "PAR lamp bulb," has many uses in yard lighting. It has a built-in reflector consisting of a thin film of vaporized aluminum on the interior of the bulb. Thus, a reflector is not needed with this bulb. Larger than an ordinary bulb, it is made of heat resisting glass. This special glass permits outdoor use without danger of cracking when exposed to rain, sleet, or snow. Projector lamp bulbs (PAR) are available in "spot" and "flood" types. As the name suggests, the "flood" lamp throws a wider beam of light than the "spot" model.

The projector bulb is a good choice for lighting a long, narrow area. For example, providing light for the pathway from the house to the barn. If the distance

Reprinted by permission from The Southern Planter,
Richmond, Virginia, October 1951

is not too great, one projector lamp placed high on the barn or house will be satisfactory. You can also use these lamps in clusters on a centrally located yard pole. With this arrangement, a large circular area of the farmstead can be lighted.

Adjustable Spotlight Bases. A waterproof socket and fixture are required for projector lamp bulbs. These are called adjustable spotlight bases. These devices have a gasket which gives a waterproof seal when the bulb is screwed into the socket. The bases are also adjustable so that you can direct the beam of light as you wish.

For convenience, yard lights must be controlled by more than one switch. If your most traveled path is between the house and barn, place a 3-way switch at each building. These switches allow the yard lights to be turned on or off from either place. The lights can be operated from other buildings, too, by installing a 4-way switch at each location. On many farms, yard light switches are needed at the house, barn and garage. The switches and wiring required for several control points are often quite expensive. In such cases, it is well to consider using remote control for the yard lights.

With the remote control system, you can operate yard lights from many places at comparatively low cost. This method consists of a control unit which is usually mounted on a centrally located pole. From this control unit, inexpensive wire is run to the various switch locations. Low-cost push button switches are used with this system. The wiring to these switches can be buried in the ground or it can be supported on poles and buildings above ground. Several lights can be connected to a single control unit. When one of the switches is pushed, all of the lights go on or off at the same time.

For best results, plan the location of yard lights carefully. On some farms one light is enough; on others additional yard lights are needed. Bracket lights can be mounted on a pole or on the side of a building. For wide distribution of light, the unit should be installed on a pole. Place yard lights near the center of greatest farm activity. Bracket lights should be at least 15 feet above ground. Bear in mind that trees, buildings, and the pole itself cause shadows that prevent full use of light. Mount the fixtures so that the shadow of the pole will not fall in an area where good lighting is needed.

It is often desirable to have additional light around the buildings. Regular lamp bulbs in angle reflectors or projector bulbs are ideal for this purpose.

When projector (PAR) lamp bulbs are used for yard lighting, they should also be at least 15

feet above ground. The areas to be lighted will determine the best location for them. For long narrow areas, consider placing them high on the side or end of buildings. For a large circular area, plan to use a cluster of these lamps on a properly located pole. Adjust the spotlight bases to obtain the best possible lighting in the areas where illumination is most needed.

A good yard lighting system will pay dividends in terms of convenience, efficiency in doing the chores, personal safety, and burglar protection. The cost of electricity for outside lighting on the farm amounts to only a few pennies a month.

How Our Allies In Europe Farm

Condensed from New Jersey Farm and Garden

Gerald L. Seaman

LAST summer Everett Mitchell and I visited 15 European countries in 42 days, and spent every available minute in rural areas with actual farmers.

Naturally, we cannot qualify as experts on European agriculture in so short a time, but we came home with the definite impression that our allies in Western Europe are doing a splendid job of trying to stand on their own feet in producing food and fiber.

We made tape recordings each week in Europe for use on the National Farm and Home Hour, which Mr. Mitchell emcees and which I help to plan and program. These were flown back to Chicago and used by other announcers in our absence.

Here's a brief run-down on how Western European farms operate and how these countries looked to us:

West Germany has about 2 million farms in an area the size of Oregon. Sixty per cent of them are less than 13 acres in size. The people are thrifty and industrious. More than 14 million families were forced to move from East Germany to West Germany on two hours' notice. Displaced persons are a big problem, since they had to leave all possessions behind and enter an already overpopulated area. Wages are low. Prices are high. Often the entire family must live in one room.

Denmark is one of the most prosperous countries we observed. The main crops are sugar beets, potatoes, grain, alfalfa, flax, and good pasture for the fine herds of dairy cattle. Dairy products and

Reprinted by permission from New Jersey Farm and Garden,
Sea Isle City, New Jersey, November 1951

pork are the main exports. Danish farmers are experts. They use a seven- or eight-year crop rotation with much manure and fertilizer.

Sweden is a land of forests, lakes, and farms. Mechanization is making good progress there, with tractors increasing from 20,000 in 1945 to 75,000 now. There's no open buying and selling of land. The government has first priority on any land available. This power is used to slowly bring about land consolidation and larger farms, which permit efficient use of power machinery.

Norway, like Germany and Sweden, values her forests highly and cares for them as we might care for parks. Forests are planted and harvested as carefully as other crop land. On small farms without enough pasture, the cows are moved to the mountains for the summer. The women go along to care for the cows, do the milking, and make the cheese for export. We saw several barns being used for mushroom culture during the summer while the cows were away in the mountains.

In Finland, land reclamation is receiving top priority and government financing. New farms are literally being carved out of the more level forested areas. The long summer nights help make up for the short growing season. Land drainage is a big problem and is mainly accomplished by ditching. The Russian border runs within 10 miles of Helsinki and is well guarded on both sides. It took a third of all Finland's wealth to pay Russian reparations and all but 4% of the bill is now paid. Even so, they'll defend their country again if the occasion ever demands.

At Amsterdam in the Netherlands we landed at an airport 15 feet below sea level. It's an odd feeling to see boats moving along in the canals above you. Excellent progress is being made reclaiming land flooded during the war and in pushing the Zuider Zee farther back to gain new farm land. Dikes are built, salt water pumped out, and fresh water pumped in to leach the salt from the soil before cropping. Land is heavily fertilized and heavily cropped. The Netherlands has a population of 740 people per square mile. New York State has less than half that number.

In France we found one of the best rural youth programs in Europe. Like all other Europeans they have a real love for their land and their animals. An acre is precious and cared for like a garden. They don't mind missing sleep to insure a live calf or extra live pig at calving or farrowing time. Both mechanization and the use of fertilizer are making excellent progress in France.

We visited the Po Valley of Italy and found the land there level, fertile, and growing about

the same crops as we do in the Mid-West. Farm labor in Italy is highly unionized. The law requires the use of at least 14 laborers for every 25 acres, so naturally most of the farming operations are conducted by hand. We saw a fine herd of Holsteins on the Vatican farms. The original bloodlines came from the Carnation herd in Washington State.

We found Greece hot and dry, with the temperature often 115 degrees. Much of the land is rocky and poor. And with poor land go poverty stricken people. A trip through Greece will convert you to soil conserving practices if you aren't already converted! Since the war, Greece has encouraged cotton production, and we saw one cotton gin built with ECA fund assistance.

We found Israel a land of busy people with much work still in front of them. Half of the 5 million acres are now arable. The balance is too eroded or too dry. Overhead irrigation is encouraged and practiced to save water and to get water on the hilly land. Little livestock is grown, due to a lack of forage. The meat ration is a quarter pound per person per week. Poultry raising is encouraged. Military service is compulsory for women as well as men.

The land in many parts of Turkey is fertile and much like the great plains of western Kansas and Nebraska. We think Turkey has the greatest potential for expanded agricultural production of any country we saw. More machinery and more knowledge of machinery maintenance are great needs. Turkish crops were good this year.

Switzerland is in the best shape economically of any country we visited. Part of the reason is that they have a good balance between agriculture and industry. Swiss fields with a slope of 45 degrees are farmed, even though the hay must be cut with a scythe and carried to the barn in a net slung over the shoulder. Switzerland has a prosperous dairy industry.

In England we saw many fine Hereford cattle and some excellent pastures. Pastures are managed with the care we'd give a lawn. English farms have been more highly mechanized for more years than most of the European countries. Buildings are neat and well kept.

In Scotland we saw thousands of fine Oxford sheep and excellent herds of Aberdeen-Angus beef cattle. The main crops were oats, wheat, and turnips. These crops, along with the fine pastures and excellent animal husbandry practices, were especially outstanding.

From the air, Ireland certainly looked like the Emerald Isle, with its green pastures bordered with hedge and stone fences. Ireland has some excellent Milking Shorthorn cattle and many fine, large,

white, bacon-type hogs so common in the countries of Northern and Western Europe. Diet levels seem higher in Ireland than in England with more milk, meat and eggs available in stores and restaurants.

The international farm youth exchange project is making a great contribution to better understanding between farm people in Europe and the United States. As sponsored by the newly-organized National 4-H Club Foundation of America, initiated by the Extension Service and 4-H clubs, this project resulted in 58 American young farm men and women going to 22 foreign countries early this summer to spend four months living and working on farms.

As we visited these fine boys and girls, it was obvious that they are doing excellent jobs as "grassroots ambassadors," and that they are being well received—yes, even loved—in the homes they visit. I'm glad to report that every one of them is happy and well—and each one thinks the country in which he or she is living is the best. They told me that farm people the world around are much alike—have the same problems, same hopes, and the same kind of hospitality and love in their hearts. We certainly found this to be true.

Frost Lowers Bluegrass Value

Killing frosts lower the feeding value of bluegrass pasture, says Paul Gerlaugh, Ohio Agricultural Experiment Station animal husbandman.

This has been pointed out by six years' tests comparing the value of protein supplement for beef calves fed on bluegrass pasture. Each year tests were started in early May when grass was available and continued until early November.

Protein supplement was not a worth-while addition to full feed of corn when the bluegrass was green and growing. Supplement always gave an immediate response in gains following a severe frost or freeze even if the grass remained green in color.

This indicates, Gerlaugh continues, that when frost strikes bluegrass pastures, one should consider the need for additional protein in the ration. The amount needed would be similar to that required by cattle in dry lot quarters on roughage that does not contain legumes.

This amount is about one pound per day for yearlings or older animals with an additional half pound per day for fattening cattle.

Losses From Intestinal Parasites

Condensed from Everybodys Poultry Magazine

William H. Hardy

INTESTINAL parasites, including roundworms and tapeworms, cause serious ill-effects in poultry. For the most part, their damage is two-fold: (1) they decrease the intake of nutrients by the fowl (2) they give off poisonous wastes which are toxic to poultry. Both of these factors combined bring about what is probably the greatest threat from parasites; they weaken the general condition of the fowl. In this condition, where food cannot be assimilated efficiently and where the worms irritate the digestive tract, the fowl succumbs relatively easily to whatever diseases may be present.

Intestinal roundworms are picked up by chickens as infective eggs from the droppings. Once they reach the proventriculus (true stomach of the fowl) they hatch, making their way to the intestine where they perforate the intestinal wall and cause hemorrhages. Continued activity by the worms so inflames the walls of the intestine that it becomes nearly impossible for nutrients to pass through into the blood stream of the fowl. When the blood is unable to perform its job of taking nutrients from food in the intestine and carrying them to all parts of the fowl's body, the bird undergoes slow starvation.

Another principal enemy of the digestive tract is the tapeworm. Nearly all adult tapeworms concentrate in the small intestine. Intermediate hosts, such as flies, beetles, slugs and snails, and any other insects which feed on dung, pick up tapeworm segments and eggs. When these insects are devoured by poultry, the tiny worms they contain become attached to the intestinal wall and in a short time form mature tapeworms. Anyone who has ever seen a tapeworm is not likely to forget what they look like. They have a small head section with a number of segments attached. The head section contains cuplike organs or hooks which are used to anchor the worm to the digestive tract. As the tapeworm robs food from the intestine, it grows on more segments. Each of these absorbs food through the surface of its body. Naturally, the more segments a tapeworm adds on, the more food it takes from the fowl.

Reprinted by permission from Everybodys Poultry Magazine, Hanover, Pennsylvania, November 1951

At least nine different species of tapeworms occur in the United States. These internal marauders vary in size from one which is about a quarter of an inch in size to others which are a foot or longer. Paradoxically, it is the smallest species which is the most pathogenic—and it can be a killer. There are excellent worm remedies now on the market which are effective against several varieties of tapeworms. No single remedy now available, to our knowledge, is capable of removing *all* species of tapeworms. Poultrymen who have heavy infestations of tapeworms should not use just any remedy indiscriminately. The first problem should be to determine which species is present. This can be done by sending an infected bird to a diagnostic laboratory for examination. Once the specific type of worm is known, the treatment can be administered.

One of the most disheartening things in trying to control tapeworms is the fact that destroying a few segments does not mean that the worm will die. Any number of these segments can be removed from the head section, and more segments will grow on.

The damage caused by tapeworms is directly proportional to the degree of infestation. A light infestation may produce almost no pathological change, whereas a heavy concentration of worms brings about a severe, chronic diarrhea. Layers heavily infected with tapeworms can maintain fair egg production, and this has led many poultrymen to believe that the worms constitute no problem. Some authorities even recommend that no action be taken to rid the flock of tapeworms. However, this brings in another consideration which may have escaped notice; it would be interesting to find out just how much feed a tapeworm—infested layer eats, and how much it costs to produce eggs from a worm-infected flock. A hen requires a certain amount of feed to maintain her body and additional amounts to support egg production. If she has an intestine full of worms, obviously, the hen must eat extra feed to overcome the effects of the worms and this will result in inefficient conversion of feed into eggs.

In the case of large roundworms, there is considerable evience to indicate that they have a definite aversion to a normal protein diet. A normal protein diet is considered to be between 18 and 20 percent. Studies recently submitted by Dr. Bernard B. Reidel and Dr. James E. Ackert, Kansas State College, showed that when the protein content of a ration was low (11.83%), chickens became extremely susceptible to roundworm infestation. When the diet was too high in protein (24.36%) roundworms gained greater foothold than in

a normal protein ration (18.75%), but not as much as when protein content was subnormal.

It was also pointed out that age is a factor in resistance to roundworm infestation. Reidel and Ackert found that worms were fewer in number and smaller in size as the age of the bird advanced.

What can we learn from these experiments? First, it shows that roundworms will prove less of a menace when the protein content of the ration is substantial. The poultryman who feeds a low-protein, cheap ration may be opening the way not only to nutritional deficiencies, but also to parasitic invasion.

Secondly, is has been shown that young birds are more susceptible to roundworms than are older birds. This is perhaps the important factor to consider before placing young stock on old litter. Manure harbors both roundworm and tapeworm eggs, and it is not unreasonable to assume that chicks would be exposed to these parasites far more on old litter than they would on new. This should not be considered as an indictment against the deep litter system of management. Even the proponents of deep litter do not recommend that young birds be placed on old litter which is known to be teeming with dangerous parasites. Deep litter seems to be a sound practice in many ways, but it should not be considered as a cure-all.

General symptoms of worm infestation are a pale and unthrifty condition of the birds. Specific symptoms are diarrhea, weakened condition, pale comb and wattles, and at times, emaciation.

Management is the easiest way to prevent or lessen outbreaks of internal parasites:

1. Change litter, even deep litter, when it becomes damp.

2. Use poultry yards of well-drained soil. Wet soil is an ideal home for parasite eggs.

3. Make certain the poultry yard has no puddles. This is a good place for the birds to pick up infection.

4. Rotate yards and ranges. Turn over infected range, expose to suns rays, and plant green cover crop.

5. Do not raise different species of fowl together. Turkeys are especially adept at spreading tapeworms (roundworms which attack trachea of chickens) to chickens.

New remedies are showing g r e at e r effectiveness against worms than ever before. Iodine, nicotine and tetrachlorethylene compounds are proving highly effective against roundworms. Several of the new and improved remedies are quite efficient in removing the entire tapeworm, and not just segments. In addition to this, some worm remedies are also capable of destroying coccidia

oocysts, doing two jobs simultaneously.

Cecal worms are trouble-makers on two scores. Not only do they cause hemorrhagic or inflammatory conditions in chickens, but they also are carriers of the organism which causes blackhead in turkeys. Fortunately, there are several extremely effective remedies on the market which will remove cecal worms.

The Battle For Clean Streams

Condensed from Pennsylvania Farmer

Frank C. Edminister

A RECENT news release from the Conservation Department in New York told of a pollution case in one of the best trout streams of that state. An electroplating plant had allegedly dumped cyanide waste into the stream thereby killing all of the trout and other aquatic life for a distance of fourteen miles. Included were 17,000 legal size trout and 22,000 fingerlings stocked in the river in recent months.

The state was preparing to launch legal action against the offending company to recover damages. Assuming they are successful, and the firm is made to pay for its destructive act, we will have another example in the battle that is gradually being won to curtail wasteful industrial and civic pollution of our public waters. It is only in recent years that a few of our states have enacted anti-pollution laws that have teeth in them to make them really effective. Pennsylvania's clean streams laws that are at long last curtailing the dumping of coal mining wastes into our waters are an outstanding example of the progress being made in this vital field of conservation. But in most states, flowing waters continue to be used as a free dumping area for sewage and factory wastes just as though that was a proper privilege in this free country of ours.

Conservationists have long cried out in wrath at this pollution but they have mostly been voices in the wilderness. Industry and cities have contended that they could not afford to treat their wastes so they could be disposed of without damage to streams. But one by one cities have installed sewage treatment systems, increasing taxes to cover the cost. Some have even converted these organic materials to a saleable form, as Milwaukee

Reprinted by permission from Pennsylvania Farmer, Pittsburgh, Pennsylvania, October 27, 1951

has done with its "Milorganite" fertilizer.

Persuading industry to clean up its pollution is not so easy. It is not just a question of laws and their enforcement but of recognizing that streams should not be used as free public sewers. Treatment of factory wastes is a legitimate and necessary cost of production. Owners have a social responsibility to their community, state and nation to keep our waters clean. We hope they can find ways of handling their wastes without high costs. But regardless of costs the dumping of destructive materials into public waters must stop.

America is becoming more water conscious all the time. From New York to California trouble with water shortages, salt infiltration, sedimentation from erosion, floods and drouths, and chemical pollution are mounting. Losses of trout and the associated fishing recreation such as occurred in the New York stream is just one cost in an ever-increasing chain that reaches into the pocketbook of every citizen.

Cities must have the water they need. Industry must have the water it needs. Farming must have its share of water. And the health and well being of our citizens demands good water for recreational uses too. To have enough water for all of our needs first requires an acceptance of standards of proper use of land (watersheds) and water. The elimination of destructive pollution is primary among these standards.

Keep Furrows Up

Fall plowing methods on most farms need revision in light of our observation. The objective of too many farmers is a perfectly flat surface. This looks like a workman-like job, but it is all wrong from the soil standpoint.

If furrows are made to stand on edge there is much better entrance for heavy rains or melting snows. On lighter soils there is much less danger of topsoil blowing away. A field plowed "flat" is so packed by spring that it almost needs re-plowing before planting. Rains have run off, frost has had no chance at the subsoil, gullies may develop and fence rows look like snow banks from drifting soil.

—N. J. Farm & Garden

Antibiotics and Plant Protection

Condensed from World Crops

Erna Grossbard
Imperial College of Science and Technology

ANTIBIOTICS are 'chemical substances produced by micro-organisms which inhibit the growth or interfere with the metabolism of other micro-organisms.' Penicillin and streptomycin are examples; they represent a new source of chemotherapeutics against diseases of man and animal and in the not-too-distant future the plant as well. The term antibiotic is justified in the sense that these substances act 'against the life' (anti-bios) of micro-organisms, many of which are causal agents of disease; it is curious that they affect micro-organisms closely related to those which manufacture them. Thus patulin is produced by the mould *Penicillium patulum,* but inhibits the olive-coloured mould attacking citrus fruits, *Penicillium digitatum,* while streptomycin, produced by *Streptomyces griseus,* inhibits the growth of *Streptomyces scabies,* which is responsible for the scab disease of potatoes.

Antibiotics are produced mainly by three groups of micro-organisms, most of which have been isolated from the soil, *viz.* the actinomycetes, the bacteria and the fungi.

Actinomycetes are very efficient scavengers, breaking down animal and plant residues in the soil. Many resemble bacteria, others are closely related to fungi, but their filaments are much thinner than the fungal threads. Certain actinomycetes are serious pathogens, causing actinomycosis in man and animals, or scab on potatoes. The number of antibiotics produced from actinomycetes is very great and increases daily. Streptomycin, chloromycetin, the new drug against typhus, and the two antifungal substances, *actinomycin* and *musarin,* are all produced by this group of micro-organisms.

Many of the soil bacilli also produce antibiotics. Tyrothricin, consisting of gramicidin and tyrocidine, was isolated and crystallized several years before the discovery of penicillin, but its considerable toxicity limited its use in medicine. *Bacillus subtilis,* one of the most common soil organisms, produces at least four antibiotics, of which subtilin is prob-

Reprinted by permission from World Crops,
17 Stratford Place, London W 1, England, May, 1950

ably the most promising. The antagonistic properties of the fluorescent bacteria of the Pseudomonas group were known in the nineteenth century and attempts were then made to use them therapeutically but with little success.

Among the fungi the most efficient producers of antibiotics are the moulds, and of these *Penicillium notatum* is the best known. It is this fungus which has yielded the classic antibiotics, *i.e.* the penicillins. Other Penicillia and numerous Aspergilli also manufacture a varied range of antibiotics of less importance than penicillin, such as aspergillic acid, frequentin, gladiolic acid, gliotoxin, mycophenolic and patulin. They are among the few antibiotics which in laboratory experiments have so far been shown to inhibit the growth of plant parasites. The so-called higher fungi, *i.e.* the toadstools and mushrooms, have also recently been tested and a number of potential antibiotic producers found among them.

The same antibiotic may be produced by several micro-organisms. For instance, gliotoxin is manufactured by the dark-green mould Trichoderma, by several Penicillia, by *Aspergillus fumigatus* and by a species of Gliocladium. Patulin is another example; *Aspergillus clavatus* and several Penicillia, one of them a parasite on apples, all give rise to it and it is interesting to note that patulin, which is very active against plant parasitic fungi, is itself produced by a parasite.

On the other hand, the same species of micro-organism can manufacture more than one antibiotic. *Penicillium notatum* produces two antibiotics, penicillin and notatum, *Bacillus subtilis* yields several antibiotics and *Streptomyces griseus* manufactures streptomycin, grisein and actidione. Although these antibiotics are produced by the same species they differ greatly from each other and affect a different range of organisms. Penicillin acts mainly on bacteria of the group which is termed 'Gram-positive';* notation on the other hand can inhibit both Gram-positive and Gram-negative bacteria in the presence of glucose. Two of the antibiotics formed by *Streptomyces griseus* are antibacterial only, while the third, actidione, is antifungal and does not affect bacteria at all. This specificity in their biological activity is a characteristic feature of antibiotics in general. Though penicillin succeeded where such powerful drugs as the sulphonamides failed, the number of bacteria affected by it is small, and fungi are not sensitive to it. There is there-

* *Gram-positive.* A certain group of bacteria which when stained with certain aniline dyes and iodine have the power to retain the stain when treated with a decolorising agent such as alcohol.
Gram-negative. This group of bacteria becomes readily decolorised when treated with alcohol. It lacks the power to retain the primary stain.

fore little hope that one day an antibiotic will be discovered which can act as a general remedy against all diseases, although one is perhaps justified in assuming that among the micro-flora of the soil one antagonist at least exists for any one micro-organism.

Antibiotics are by-products of the metabolism of micro-organisms, but they are not always formed. An organism can grow luxuriantly on a medium without giving rise to the antibiotic substance associated with it. In fact, it is only when the highly specific nutritional requirements are fulfilled and there is an adequate supply of oxygen and the correct temperature and other environmental conditions are satisfied that the desired antibiotic can be produced.

It has been suggested that the formation of an antibiotic is a sign of sickness in the micro-organism, but for this hypothesis there is little support.

From the chemist's point of view antibiotics are a very interesting group, comprising many different chemical compounds, some of which are chemical novelties. Antibiotics can be polypeptides such as those produced by soil bacilli; some are quinones as fumigatin; others are lipoids, or pigments, or sulphur-containing compounds. Many of the antibiotics produced by moulds are organic acids.

Many antibiotics are water-soluble, which facilitates their isolation. Some are unstable, stability being dependent on such factors as acidity. Gliotoxin, for instance, retains its activity only when acidity is so great that no plant growth would be possible. Many substances inactivate antibiotics. Penicillin is destroyed by penicillinase, an enzyme of microbial origin; and *Bacillus subtilis,* which is most sensitive to the action of penicillin, is itself capable of producing penicillinase, thereby destroying its attacker.

The action of antibiotics is to inhibit growth rather than to kill sensitive micro-organisms. They interfere will cell division, enzymic action and other essential life processes. Antibiotics, however, are also lethal toxins and can kill and disintegrate living cells. Our knowledge concerning the exact mechanism of antibiotic action on sensitive micro-organisms is as yet still very scanty.

The causative agents of plant diseases are closely related to those responsible for illness in man and animal. The organisms responsible belong to the same three groups as those which produce antibiotics, *viz.* the actinomycetes, bacteria and fungi, and the great clinical success of penicillin, streptomycin and recently chloromycetin has stimulated the interest of plant pathologists in these new substances.

Little work has been done, however, on the isolation of antibiotics for use as fungicides or bactericides, although the need for new materials of this description is great. Great progress has been made in the control of insect pests as a result of the discovery of DDT, benzene hexachloride and the organic phosphorus compounds, but to control fungoid diseases we continue to spray our fruit trees or potatoes mainly with the copper or sulphur fungicides of our fathers.

In the last few years, however, attempts have been made to test the known antibiotics against plant parasites, while systematic investigations have been begun with the object of endeavouring to isolate new antibiotics, which, in particular, could be used to control fungoid diseases. Human diseases are caused mainly by bacteria, but the most important pathogens of plants are fungi, though it is true that some bacteria do attack plants and cause serious plant diseases. For this reason penicillin is of restricted value in agriculture, since it only affects a few plant pathogenic bacteria belonging to the Gram-positive group; examples are the bacterium causing crown-gall in apples, roses and other plants, and the tomato stem rot organism which, incidentally, is closely related to the diphtheria organism.

Most plant parasitic bacteria are Gram-negative and because streptomycin is very active against this group, many tests have been made with it and promising results obtained. Laboratory experiments have also shown that gliotoxin and viridine, isolated from *Trichoderma viride,* are very active against the causal agent of neck rot of onions and the fungus *Rhizoctonia,* which is responsible for the so-called 'damping-off' diseases of many cultivated plants. The antagonistic properties of *Trichoderma* towards the fungus *Rhizoctonia* were known long before antibiotics were discovered.

Patulin inhibits the growth of bacteria, causing soft rots of root crops and also affects several of the fungi causing 'damping-off' of young seedlings.

Mycophenolic acid is active against the tomato stem rot bacterium, wilt-producing fungi and the causal agent of silver leaf disease.

Musarin, recently isolated from an actinomycete from tropical soils, gave very promising results at low concentration against the agent of panama disease of bananas, against 'damping-off' and against wilt fungi.

Gladiolic acid, produced by a *Penicillium* which is itself a parasite, attacking gladioli corms, is active against cereal pathogens, against the *Penicillium* which rots apples, against a spoilage or-

ganism of jam and, incidentally, poisons the fungus which produces it. This list is by no means complete, but it serves to illustrate the possibilities for the purpose of plant protection.

Not only is this type of research in its infancy but the difficulties which have to be overcome in utilizing antibiotics as fungicides or bactericides are very great. Many antibiotics are toxic not only to such primitive plants as bacteria or fungi but also to crops. Many are unstable when exposed to the air or injected into the soil, where they may be destroyed by enzymes of microbial origin or by other agents. Some retain their activity only when acidity is very marked. Production costs are also all-important, but the success already achieved in synthesising chloromycetin induces the hope that ultimately it may be possible to produce antibiotics cheaply by synthesis.

A few encouraging examples of practical application of antibiotics for disease control have already been reported. It has been claimed that gall formation can be arrested in plants attacked by crown gall when the galls are surrounded by cotton wool soaked in penicillin. Streptomycin is too toxic to the growing plant to be applied as a spray but seed is resistant and very good results have been obtained by dipping seeds from plants, infected with the tomato stem rot or angular leaf spot organism of the cucumber in a dilute solution of streptomycin. The treated seeds gave rise to healthy plants. Subtilin has shown promising results as a seed dressing against a disease of barley. Powdery mildews have been eradicated from plants treated with actidione at a dilution as low as one part per million. However, in spite of these promising results, the counterpart of penicillin for the plant pathologist has yet to be discovered.

The farmer may have made use of antibiotic substances to control disease without being aware of it. This control involves the effects of microbial antagonism. This phenomenon has been known to occur in mixed cultures of micro-organisms for a very long time and its effects on disease control have been observed. It was not possible, however, to explain the mechanism of microbial antagonism which is defined as 'the phenomenon of a living micro-organism inhibiting the growth or interfering with the activities of another living micro-organism as a result of the creation of unfavourable conditions in the medium or the production of a specific antimicrobial substance.' The unfavourable conditions may consist in the exhaustion of food and oxygen supply, in the lowering of the acidity, in the limitation of the living space, in the

accumulation of excess carbon dioxide and so forth. In short, microbial antagonism is the manifestation of the competition between micro-organisms in the fight for survival.

Many of the organisms which cause plant diseases live in the soil and it has long been known that the composition of the soil microflora can exert a controlling influence on them. This effect is closely connected with microbial antagonism; when a soil has been sterilized, competition between micro-organisms is reduced or eliminated, and when such a soil becomes later invaded by a parasite the disease spreads much more quickly and is more virulent than in a natural non-sterilized soil. Thus the microflora of the soil acts as a barrier to the invader.

The incorporation in the soil of large quantities of organic matter may often bring about important changes in the microflora. Normally there is equilibrium among the micro-organisms, but changes in the organic matter content may disturb this and profoundly affect the composition of the microbial population both in regard to numbers and type. Heavy applications of organic manure stimulate the growth of saprophytes, which live normally on dead organic material and do not attack the living plant. In some cases their development may be at the expense of plant parasitic organisms which are antagonised by them in some way not yet fully explained. Thus it has been found that land infected with potato scab gave good yields when dressed heavily with grass cuttings. Control of root disease of wheat, cotton and strawberries has been obtained by manuring with organic matter rich in carbohydrates and low in nitrogen.

The definition of microbial antagonism mentions the production of antimicrobial substances. Are these materials antibiotics? Many saprophytes when brought in the laboratory produce under artificial conditions antibiotic substances, some of which inhibit the growth of plant parasites. Are we justified in assuming that a similar process takes place in the soil in the natural environment of these antibiotic-producing micro-organisms? What part, if any, do antibiotics play in microbial antagonism and subsequent suppression of soil-borne parasites? It is not yet possible to state definitely that antibiotics are present and active in the soil but there is a certain amount of indirect evidence that this may be the case. Experiments with certain soil saprophytes have proved that when these fungi grow on materials such as straw, grass or bracken an antibiotic substance is formed which probably is identical with that produced on laboratory media.

Furthermore it has been possible to extract an antibiotic from sterilized soils inoculated with the blue mould *Penicillium patulum* (which gives rise to patulin), which inhibited the growth of many plant parasites in laboratory experiments. However, conditions in natural soil differ greatly from those in a sterilized soil and one is therefore reluctant to draw final conclusions. It is nevertheless significant that the treatment required for antibiotic production in a sterilized soil was very similar to that which brought about control of certain soil-borne diseases. Recent experiments have also shown that an antibiotic in low concentrations could be extracted from natural soil which had been treated with glucose, straw or other organic carbon compounds.

These academic investigations into whether or not antibiotics are present and active in the soil may have important practical results, since they may eventually make it possible to induce artificially the production of antibiotics in the soil which are active against soil-borne plant parasites, thereby enabling the control of a disease at its very origin. Some experiments on these lines have already been carried out and have given both successful and unsuccessful results. They consist in the inoculation of soil with bacterial or fungal cultures known to antagonise a given plant pathogen. Russian scientists claim that the inoculation of seeds with antagonistic bacterial cultures, has led to the suppression of diseases of wheat. Recent reports from India claim a control of wilt on cotton by introducing bacterial cultures into soil harbouring the disease, but these latter experiments were made on a laboratory scale only.

The earliest work on these lines has been carried out on the 'damping-off' disease of citrus seedlings; it was found that when the antagonist *Trichoderma* was introduced into an infected soil, a large proportion of the citrus seedlings planted in it remained healthy. It was demonstrated that the fungus *Trichoderma* disintegrated the fungal threads of the parasitic organism bringing about its death.

Trichoderma produces the two antifungal antibiotics gliotoxin and viridin.

In recent experiments in England on 'damping-off' disease, manuring of the soil in addition to inoculation with antagonistic organisms was carried out. The results were promising but not entirely consistent; in some cases the disease was stimulated.

Our knowledge concerning this type of biological control of disease is still very limited, and a great deal more research is needed before the possibilities can be fully

assessed. All investigations into the biological processes of the soil are difficult, but the possibilities of this novel method of disease control makes the work well worth while pursuing.

If ultimately a method of satisfactorily controlling soil-borne diseases by the use of antibiotic measures is found it might eventually be possible to eliminate some of the costly and elaborate methods which are at present employed.

A New Soil Checking Tool

University of Nebraska soil scientists now have a new tool to detect trace elements in soil.

The gadget has been used by the FBI for many years for detecting invisible writing and fingerprints.

Dr. Roy P. Matelski says the instrument, called a fluoretor (fluorescent scope) can find those minerals which will give off a fluorescent light when viewed through the instrument. The fluoretor has a tube like a flashlight and is operated by ordinary batteries.

One attachment on the instrument will detect minerals or inorganic components of the soil and another unit will find the organic material which gives off a fluorescent light.

The attachments are short wave lamp units which transmit ultraviolet rays. Scientists are now hoping for more attachments which will enable them to find more trace elements.

Substances like zircon and calcium carbonate and minerals like zinc and boron often contain impurities which give off the fluorescence, making them easy to find with the instrument.

The practical application of the gadget is that scientists can look at a sample of soil and may with other tests determine the kind of trace elements it contains. Then, if some of them are absent from the soil, they can be replaced by commercial fertilizer.

—*Nebraska Farmer*

Marketing Alfalfa-Brome Through Steers

Condensed from Iowa Farm Science

Dr. J. M. Scholl, Dr. C. W. McDonald and Dr. Earl O. Heady
Iowa State College

WHEN you grow more grasses and legumes in the crop rotation, then you need to find a profitable market for this extra forage. One way to sell it is to turn it into beef. But what are the best ways to manage pastures and cattle to get highest returns?

To get highest profits in farming, you must fit your cropping and livestock programs to your capital, labor and land resources. Also, you have to consider your own ability as a manager.

Most Iowa farmers have many alternatives to choose from in organizing their crop and livestock programs. No one organization of the farm business is best for every operator and every farm.

This article reports the results from several different systems of forage and pasture utilization. These systems are not represented as the feeding systems most profitable for *all* farms and *all* price relationships. However these results do suggest how different feeding programs may fit into different farm situations.

New studies now underway eventually will provide information on other types of cattle and other forage-feeding systems. The results of the study reported here deal with choice yearling steers. But before we look at these results, let's consider the farm management or profit angles of feeding systems or rations.

The best rotation for your farm depends as much upon the way in which feeds substitute for each other in the ration or feeding program as it depends upon the soil itself. The best rotation and the best ration or feeding system are not things you can decide independently—one depends upon the other. Here's why:

First, grain and forage crops can be *complementary* in the rotation—that is, by growing more hay, the soil may be improved so that you may be able to grow more grain on the same land. The result is an increase in both hay and grain yields. You needn't worry about using forage when it is complementary with grain. You can simply let the hay go down as green manure and still increase profits. By growing more com-complementary hay, you can increase the value of the grain

Reprinted by permission from Iowa Farm Science,
Ames, Iowa, November 1951

produced and at the same time lower your total cost of production.

So even if you don't utilize it, complementary hay is profitable. Still, if you're able to feed this hay and sell it at a profit, you're able to add that much more to your income.

But hay or pasture also can *compete* with grain—that is, an increase in hay and forage acreage results in fewer total bushels of grain. This is where the livestock system becomes important. Whether or not forage should be grown at the expense of grain depends upon how the two substitute both in the rotation and in the ration.

Suppose, for example, that a shift from one rotation to another means that you'll get 1 pound less grain for each extra 2 pounds of hay you gain. Now if you can substitute 1½ pounds of hay for 1 pound of grain by shifting from a high-grain feeding system to a high-forage system, then you can produce more beef and likely more profit by growing more hay even when it competes with grain.

If it takes 5 pounds of forage to substitute for 1 pound of grain in the feeding system, the change in the rotation isn't likely to be profitable. It would result in a production from a given acreage.

Another important aspect of any rotation is its effect on soil productivity. We've been studying, at the Soil Conservation Experimental Farm at Clarinda, a C-C-O-M-M rotation. We've been obtaining information on the effect of forage on the yield of other grain crops in the rotation. These effects increase over time, and additional results will be reported later.

Up to now our results have been steers only. We recognize that the methods compared up to this time are not the only nor necessarily the best ones. And, because seasons vary so greatly, it will be necessary that we continue our studies for a number of years to come.

But after 5 years of producing beef from choice feeder steers on alfalfa-bromegrass pastures under different grazing systems, here's what we can say right now:

● Grazing alfalfa-bromegrass pastures during May and June and then self-feeding ground ear corn has given greatest returns over feed costs with choice yearling steers under the conditions of this particular study.

● Rotation grazing has shown no superiority over continuous grazing.

● Controlled grazing showed these advantages over continuous grazing: (1) Surplus feed is preserved and made available for feeding later in the summer if needed; (2) quality of the pasture is improved with mowing; (3) controlled grazing produced higher gains for the entire season

with pronounced superiority during the July-August period.

● Second-year pastures produce more hay per acre than first-year pastures. However, first-year pastures contain a higher percentage of alfalfa, a more even distribution of growth through the season and produced more *beef* per acre.

● The most profitable system, when considered from the standpoint of the farm as a whole, may or may not be the one which returns the greatest margin per steer. The most profitable feeding system depends as much on the crops grown and their relationship to each other as upon the feeding system itself. We cannot say more about the most profitable rotation and feeding system until results are available from additional years.

We compared the following methods of utilizing and marketing forage produced on alfalfa-bromegrass pastures as feed for fattening beef cattle:

Drylot: Ground ear corn, self-fed, plus 1 pound of commercial protein supplement, hand-fed once daily, plus 4 pounds of grass-legume hay per head daily, after cattle were on full feed. Cattle were fed an average of 151 days and were marketed the first week in October in Good to Choice condition.

Fed-on-pasture: Pasture without grain for the first 56 days. Cattle were then brought to a full-feed of ground ear corn and self-fed on pasture until about October 1 and later finished in drylot. They required about 30 days of drylot feeding to make them as good as the drylot cattle.

Continuous grazing: Cattle grazed without grain until about the end of the pasture season. They were brought to a full-feed of ground ear corn on pasture at the end of the pasture season and were finished in drylot. An average of about 1½ acres of pasture were available per steer. Steers required an average of 68 days on full-feed to reach Good to Choice grade.

Rotation grazing: Cattle handled like continuous-grazed cattle except that the pasture was subdivided into three parts. Steers were shifted from one part to another about every 3 weeks. These cattle had an average of about 1⅛ acres available per steer. We studied this system in 1946, 1947 and 1948.

Controlled grazing: Cattle had the same acreage allotment—about 1½ acres available per steer—as with the continuous-grazing method. But the pasture was divided. Grass silage was made from half of the area, and cattle grazed the other half. After pasture had recovered from mowing, cattle had access to the entire area—the full 1½ acres per steer available. Finally cattle were started on full-

feed and finished in drylot as under the continuous-graze method. We substituted this system for rotation grazing in 1949 and 1950.

May and June gains: All cattle made their best gains in May and June when about 60 percent of the season's total pasture growth was produced. They made almost 50 percent of their total gain during this period which was about 40 percent of the total period on pasture. In 1946, 1947 and 1948, all cattle made the same gains—slightly more than 2 pounds daily—for this period.

For the remainder of the season, the fed-on-pasture cattle, which were receiving grain, continued to gain over 2 pounds per day, while the continuous-grazed cattle gained 1⅛ pounds per day and the rotation-grazed cattle gained slightly over 1 pound daily. Fed-on-pasture cattle had ¾ acre of pasture available per steer, while the other had access to 1½ acres per steer.

The rotation grazing system failed to show any advantage over the continuous-grazing system. But the fed-on-pasture system did show definite superiority. These cattle utilized their pasture when it was at its peak, wasted less forage and received supplement feed when pastures lagged in July and August. The fed-on-pasture cattle were the most profitable during the 5 years under the conditions of the study.

The other cattle on pasture had a surplus of feed in May and June, wasted more forage and made slower gains in July and August—when the quality of the pasture growth was lower because of dry weather and advancing maturity of the grasses and legumes.

These results suggested the idea of substituting for the rotation-grazing system a method which would preserve the surplus feed as hay or silage and make available high-quality pasturage from the second growth. So in 1949 and 1950, we placed the rotation-grazing system with the controlled-grazing method.

Controlled grazing showed these advantages over continuous grazing: (1) Gains for the pasture season were 1.9 pounds per day compared with 1.7 pounds for continuous grazing; (2) daily gains for July and August were 2 pounds for controlled grazing and 1.5 pounds for continuous grazing; (3) surplus feed was preserved and was available for feeding later in the season; (4) controlled-grazing cattle made 215 pounds of beef per acre in the 120 days before corn feeding was started compared with 150 pounds for continuous grazing.

Good stands of bromegrass and pasture were established each year. First-year pastures always contained a higher percentage of alfalfa (dry-weight basis) than second-year pastures—about 60

percent for first-year and 35 percent for second-year. Bromegrass was more productive in its second year, but alfalfa stands were somewhat reduced especially in closely grazed areas.

Although second-year pastures consistently outyielded first-year pastures in hay production, first-year pastures produced a better seasonal distribution of growth.

For example, by the first week in July, second-year pastures had produced 64 percent of their total growth compared with first-year pastures with 52 percent. This fact combined with first-year higher legume content, has meant that quality of first-year pastures has been superior—resulting in cattle gains of 287 pounds per steer on first-year and 252 pounds on second-year pastures.

See table 1 for a summary of weights, gains, feed requirements and costs of gains per steer for the 5 years of the study.

The number of days the cattle were on test varied with the management systems, since all cattle were fed to the same degree of finish. Fed-on-pasture cattle required 30 days longer than drylot cattle, and other pasture methods required 76 days longer to reach the same finish.

Daily gains were highest for drylot and fed-on-pasture cattle and lowest for the methods that did not include grain feeding. Methods, not including grain feeding, also required more time.

Savings in harvested feeds decidedly were greater for those methods utilizing pasture for the longer periods. But when the cost

TABLE 1

WEIGHTS, GAINS, FEED CONSUMPTION AND COST OF GAINS PER STEER. FIVE-YEAR AVERAGE, 1946–50. CLARINDA.

	Drylot throughout	Fed-on-pasture after 56 days	Controlled grazing*	Continuous grazing
Total days fed	151	181	227	227
Initial weight (May)	787	787	784	785
Sale weight (Omaha)	1069	1120	1150	1160
Total gain (lbs.)	282	333	366	375
Average daily gain (lbs.)	1.87	1.84	1.61	1.65
Feed consumed:				
Ground ear corn (bu.)	47.5	41.3	30.8	31.6
Protein supplement (lbs.)	148	39	73	73
Hay (lbs.)	730	173	334	334
Pasture (acres)**	—	0.79	1.28	1.52
Cost of feed and pasture†	$93.25	$90.34	$86.17	$91.27
Costs per 100 lbs. gain	$33.07	$27.13	$23.54	$24.34
Feed saved per acre pasture	——	$26.01	$30.27	$24.07

* Includes rotation grazing (1946, 1947 and 1948) and controlled grazing (1949 and 1950).

** Controlled grazing cattle not charged for area producing grass silage during the time it was producing silage.

† The cost of protein supplement hay and corn based on prices paid when purchased. Pasture charge based on the value of hay produced on the pastures, less the cost of harvesting.

of these harvested feeds was added to the charge for pastures, the total cost per steer for all systems did not differ greatly. Pastured cattle sold at higher weights, but the selling price was highest for drylot cattle. During the five years of the study, cheapest gains were obtained from the systems using high amounts of pasture—but at the sacrifice of time.

No one of the feeding systems studied and reported here is the most profitable for every single year. In some years drylot feeding systems will return most; any break in market prices in early fall will favor drylot over the systems involving feeding on pastures. On the other hand, summer grazing with later finishing in drylot may easily return most in years when prices are rising. So the best system to be selected will depend a great deal on the price outlook.

To see how the system studied

TABLE 2

How Income From Three Different Cattle Feeding Systems Compared Over 31 Years

Returns per $100 of ALL costs	Feeding system	No. of years out of 31 that this income was earned
Less than $60	Drylot	2
	Fed-on-pasture	1
	Cont. graze	3
$60 to $79	Drylot	6
	Fed-on-pasture	6
	Cont. graze	3
$80 to $99	Drylot	9
	Fed-on-pasture	6
	Cont. graze	6
$100 to $119	Drylot	6
	Fed-on-pasture	7
	Cont. graze	9
$120 to $139	Drylot	2
	Fed-on-pasture	5
	Cont. graze	2
$140 to $159	Drylot	6
	Fed-on-pasture	3
	Cont. graze	4
$160 to $179	Drylot	None
	Fed-on-pasture	3
	Cont. graze	3
$180 to $199	Drylot	None
	Fed-on-pasture	None
	Cont. graze	1
$200 to $219	Drylot	1
	Fed-on-pasture	1
	Cont. graze	None
$220 to $239	Drylot	None
	Fed-on-pasture	None
	Cont. graze	1
$240 and over	Drylot	None
	Fed-on-pasture	None
	Cont. graze	None

TABLE 2 (Continued)

How Income From Three Different Cattle Feeding Systems Compared Over 31 Years

Returns per $100 of feed and labor costs	Feeding system	No. of years out of 31 that this income was earned
Less than $60	Drylot	1
	Fed-on-pasture	1
	Cont. graze	2
$60 to $79	Drylot	5
	Fed-on-pasture	1
	Cont. graze	1
$80 to $99	Drylot	5
	Fed-on-pasture	5
	Cont. graze	4
$100 to $119	Drylot	8
	Fed-on-pasture	7
	Cont. graze	6
$120 to $139	Drylot	5
	Fed-on-pasture	6
	Cont. graze	7
$140 to $159	Drylot	1
	Fed-on-pasture	4
	Cont. graze	1
$160 to $179	Drylot	5
	Fed-on-pasture	2
	Cont. graze	3
$180 to $199	Drylot	1
	Fed-on-pasture	5
	Cont. graze	4
$200 to $219	Drylot	None
	Fed-on-pasture	None
	Cont. graze	2
$220 to $239	Drylot	None
	Fed-on-pasture	None
	Cont. graze	1
$240 and over	Drylot	1
	Fed-on-pasture	1
	Cont. graze	1

here might have worked out in the past, we've gone back and applied prices of the last 31 years (see table 2).

In some years the drylot system would have paid off most on this basis. In other years the cattle fed on grass or those grazed on pasture and later fed out in drylot would have been more profitable.

The figures in table 2 also suggest the degree of risk associated with the different systems—the figures indicate what the past chances were for breaking even or better under the different systems.

Looking at the first columns in table 2, we see that in 17 years of the 31, the drylot system would have returned less than $100 for each $100 in total cost, including feed, labor, interest and depreciation on equipment, and interest on the steers. Losses, when figured in this manner, would have come about in only 13 years for cattle fed on pasture and only 12 years for cattle grazed and then fed out.

Only in 1 of 31 years would the drylot system have returned more than $160 for each $100 in total costs. The pasture feeding system would have returned $160 or more in 4 of the years, while it's 5 years for cattle grazed on pasture and then fed out.

Some farmers feed cattle mainly to get a profit on their feed and labor. We've prepared the second set of columns on this basis—showing the return per $100 of feed and labor costs.

Here the drylot system would have given a return of less than the outlay for feed and labor in 11 of the 31 years; and in 7 of the 31 both for cattle fed on pasture

How Income From Three Different Cattle Feeding Systems Compared Over 31 Years

Returns per $100 of feed fed	Feeding system	No. of years out of 31 that this income was earned
Less than $60	Drylot	1
	Fed-on-pasture	1
	Cont. graze	2
$60 to $79	Drylot	4
	Fed-on-pasture	None
	Cont. graze	1
$80 to $99	Drylot	5
	Fed-on-pasture	6
	Cont. graze	3
$100 to $119	Drylot	5
	Fed-on-pasture	2
	Cont. graze	5
$120 to $139	Drylot	7
	Fed-on-pasture	9
	Cont. graze	7
$140 to $159	Drylot	3
	Fed-on-pasture	3
	Cont. graze	2
$160 to $179	Drylot	1
	Fed-on-pasture	3
	Cont. graze	3
$180 to $199	Drylot	5
	Fed-on-pasture	3
	Cont. graze	4
$200 to $219	Drylot	None
	Fed-on-pasture	2
	Cont. graze	1
$220 to $239	Drylot	None
	Fed-on-pasture	2
	Cont. graze	2
$240 and over	Drylot	1
	Fed-on-pasture	1
	Cont. graze	2

Investment in Cattle Required to Utilize 100 Tons of Forage Under Three Feeding Systems

System	1931-35 prices	1937-41 prices	1944-51 prices
Drylot	$2,273	$3,186	$5,884
Fed on pasture	1,236	1,729	3,200
Grazed and fed out	917	1,283	2,374

and for those grazed and then fed out.

Finally since some farmers have ample labor on hand and feed cattle for the returns they can get on hay and grain, we've figured the third set of columns on the basis of returns over feed costs.

This way the drylot system would have returned less than the value of the feed in 10 of the 31 years. Cattle fed on grass would have resulted in a loss in only 7 and grazed cattle in only 6 of the 31 years. Grazed cattle and pasture-fed cattle would have returned $200 or better for each $100 feed fed in 5 years, while the drylot cattle would have given returns this great in only 1 year.

Table 2 simply indicates again that we must fit the particular feeding system to our resources and the price outlook. Looking back, we found that the grazing system gave greater returns when cattle prices were rising throughout the fall months; and this has been true in about 15 of the past 20 years.

If it weren't for price changes, perhaps one single system would always pay best. But since prices do change, it's necessary to keep your eye geared to the outlook.

Another point to consider is the amount of investment required to utilize forage under different systems. For comparison see the following figures. To put all systems on a comparable basis, we've put these figures in terms of forage (or its equivalent in terms of pasture yields).

The young farmer who's short on capital may prefer the longer grazing system in terms of capital investment. Not only is the investment required to utilize a given amount of forage less but also a smaller "stake" is involved if prices should take an unfavorable turn.

But the farmer who has ample capital or is in a favorable debt position and able to stand greater risks may prefer investment in the drylot or pasture-feeding systems since the turnover here is more rapid.

Our tests are being continued with choice Hereford steer calves for another 5 years. Methods of utilizing alfalfa-bromegrass pastures being studied are: (1) full-fed on pasture; (2) fed-on-pasture after 56 days; (3) controlled grazing; and (4) continuous grazing. Drylot cattle will serve as a check.

Side Opening Milk Cooler

Condensed from New England Homestead

Wendell C. Cook

NEXT to cleanliness, the most important phase of producing high quality milk on the dairy farm is prompt and rapid cooling. Now that the side opening type of cooler is making its appearance, a comparison between it and other types is asked for by many dairymen.

It has been shown by T. G. Anderson and John E. Nicholas of the Pennsylvania State College, and J. H. Frayer of the University of Vermont, that within two hours after cooling is started, cream separation is practically complete, with over 90% of the bacteria organisms in the cream layer at the top of the can. This means that it is important to rapidly cool this top layer.

Immersion type coolers, with provisions for water agitation, will give prompt and rapid cooling. To obtain this good performance, the cooling water must be kept at the neck line of the can at all times. This often becomes difficult when milk production fluctuates.

The inconvenience of adjusting the water level in a side opening cooler is eliminated. As the name states, the side opening cooler opens from the side and the cans slide into the cooler on racks which are from six to eight inches in height from the floor.

There are several makes of side opening coolers on the market. Some of these coolers have an ice bank in the bottom, some in both top and bottom, while others may build it around a vertical coil placed in the center or on one end.

The method of cooling for this type of cooler consists of first drawing water over the ice bank and then spraying it on the necks of the cans from which point it runs down the sides. Manufacturers have various methods of operation, but essentially they are the same. A water pump is started when the cans to be cooled are put in the cooler and runs for a pre-set time, by a time clock. This pump picks up ice cold water from a small area where there is no ice bank and pumps it to the top of the cooler. The water then enters perforated pipes, deep trays with holes along the bottom, or side, or a large pan with a ring of holes around the top of each can. This water then flows over

Reprinted by permission from New England Homestead,
Springfield, Massachusetts, October 27, 1951

the cans and back to the ice bank or cooling coils.

Comparisons between the immersion type cooler and the side opening cooler have been made in several tests. At Pennsylvania State College, it was found that kilowatt hour consumption for the side opening cooler was less than for the immersion cooler. There was little difference in bacteria count.

A test was made in 1950 by the Farm Department of the Central Vermont Public Service Corporation, at the Elbridge Adams farm, at Rutland, Vermont, on the general performance of a twelve can side opening milk cooler. All milk was placed in the cooler at or above 90° and in 70 minutes, it was cooled to below 50°. The average kilowatt hour consumption per 40 quart can of milk was 1.1 kilowatt hours. This requirement is well in line with the immersion type cooler.

The disadvantages of the side opening cooler are not at all serious. The most serious is dependence upon the pump for the cooling of the milk. This pump would not operate in case of a power outage, but this problem is not as serious as it was formerly. On the larger size coolers the doors may sag after a time if they are not well constructed, and the gaskets may need changing. The circulating water may have to be changed more often, but this is easy to do since a drain is provided at the side near the bottom.

The advantages of the side opening cooler make it appeal to many farmers. No heavy lifting of the milk cans makes the milking chore much lighter. No unsanitary pit is necessary, and in cases of emergency, it may easily be moved. The cooling water temperature is kept at 32° for most of the cooling period, which is several degrees lower than normal for a conventional cooler. This lower temperature greatly adds to the cooling capacity of the water. The cooler is easy to clean. The narrower width allows the cooler to be moved through most milk house doors.

The performance of the side opening cooler in the tests made thus far show results that are very favorable in preventing bacteria growth and rapidity of cooling. The cost of operation is in line with immersion type coolers.

With the advantage of little lifting and the cold water always hitting the necks of the cans regardless of the number placed in the cooler, there seems to be a good possibility for the side opening cooler to gain in popularity.

Soil Fertility and Human Nutrition

Condensed from Farm Research

Dr. L. A. Maynard
Cornell University

THE RELATIONSHIP of soil fertility to human nutrition and health is a widely discussed subject. Hardly a month goes by without the publication in some popular magazine or trade journal of an article on this topic. There is certainly a general relationship of large significance. Many peoples throughout the world are malnourished because the available land is not productive enough to supply them with either the total amount or the kinds of food needed. Their health suffers accordingly. Much more specific relationships are implied by statements that various diseases occuring in our own population are directly traceable to soil deficiencies. What are the facts as determined by research?

The importance of the soil in relation to certain mineral nutritional troubles in grazing animals has long been known. These findings are frequently cited as evidence that the human population may similarly suffer from troubles caused by soil deficiencies in certain areas. Aside from trouble caused by iodine deficiency, however, the intake of which is governed primarily by the water rather than the food supply, no specific human ill has been traced to a specific soil deficiency. Actually, the general situation is by no means comparable for animals and man. Differing from the case of the grazing animal, man's food generally comes from a variety of localities across the country. Home-produced food may play a very minor role in the diet he chooses. Also, much of his food is so altered by manufacturing, preserving, and cooking processes that one cannot properly attribute to soil factors any nutritive deficiencies that may be noted.

The statement that human diseases are caused by area soil deficiencies is based upon inferences rather than experimental evidence. For example, someone may point out that certain diseases, not necessarily nutritional, are increasing in an area where there is evidence that the soil lacks certain nutrients needed by food crops, or is low in general productivity. Then the conclusion is

Reprinted by permission from Farm Research
Geneva, New York, October 1951

drawn that the character of the soil is responsible for the ill health, or at least for a higher incidence of certain specific diseases. Other factors, such as low economic status, lack of medical service, and ignorance, are disregarded. Commonly little or no attention is given to the source and kind of food actually eaten. If these basic factors are neglected the above conclusions have not the slightest basis. Moreover, no foundation whatever exists for the speculation that declining soil fertility may be responsible for the increase in degenerative diseases such as cancer, arthritis, and heart troubles.

In addition to their influence in producing a larger total food supply, fertile soils also widen the choice of crops that can be grown. Every farmer knows that if a soil is suitable for growing a legume such as alfalfa instead of timothy, the forage produced can be markedly richer in protein, calcium, and carotene. This can in turn benefit human nutrition by increasing the supply of milk, meat, and eggs produced in a given area. In addition, fertile soils can contribute directly to better health through the production of important food crops in kinds and amounts otherwise impossible. For example, without fertilization with various elements, the soils of the Eastern seaboard would not produce the nutritionally superior fruits and vegetables so important to the diet. In all of these respects, soil conservation and improvement can result in better human nutrition.

By contrast, there is little basis for the frequently made claim that the fertility level of the soil markedly influences the nutritive value of specific food crops and animal products. The fact that grazing animals are malnourished on soils lacking in certain minerals is apparently responsible for the idea that their products used for human food may be lacking in the minerals, and other essential nutrients as well. Thus it has been stated repeatedly that milk from cows obtaining their feed from poor soils will not build good bones in children because the milk will be low in calcium and phosphorus. This statement is totally untrue, as many experiments have shown. So also is a statement that poor soils lower the muscle- and blood-building value of meat. While certain trace elements are known to vary in meat, milk, and eggs according to animals' ration, there is no evidence that these particular minerals are ever deficient in the human diet.

The vitamin content of milk and butter is markedly influenced by the food of the cow, but the effect here is due to the kind of roughage consumed, its stage of maturity at harvest, and storage factors. In none of these does the soil play a direct role. The level

of certain vitamins found in eggs varies according to the feed of the hen, but the potency of this feed is dependent upon the ingredients chosen and not upon any soil effects. On the basis of present evidence, it may be concluded that the soil has little, if any practical effect upon the nutritive value of the animal products which provide over 30 per cent of the calories of our diet and much higher percentages of several of the special nutrients.

One might expect the answer to be different for the foods obtained directly from the soil, such as cereals, vegetables, and fruits. The fact that specific types of food crops as harvested do vary widely in certain minerals and vitamins suggests a definite soil relationship. Since, however, other factors such as variety and climate are known to have an influence, one must have specific evidence regarding the effect of soil.

The general question is not of practical significance for the cereals which make up nearly 30 per cent of the human diet, for their products used as food are so modified in milling as to make variations as grown of little concern. Fruits and vegetables are important sources of various minerals and vitamins needed by man. The soil does have an influence on their mineral content, but significant relations in terms of the minerals in which the human diet is likely to be lacking have not been established, despite widespread and enthusiastic claims to the contrary. Extensive experiments have failed to show that, for a specific variety of vegetables, calcium, the mineral most frequently deficient in the human diet, is significantly and regularly higher when the crop is grown in a soil high in the element, either naturally or through fertilization. In fact, calcium content may be decreased by fertilization with the other elements. Experiments have been similarly unsuccessful in demonstrating any consistent relationship to soil fertility of the iron or other major-element content of fruits and vegetables. There appears to be a more direct relationship with certain trace elements. Where copper, manganese, zinc, and boron improve plant growth, there tends to be an increase in the plant as well, but the reverse can happen. There is no evidence, however, that these trace elements are ever deficient in an otherwise good diet, in terms of mans needs.

Fruits and vegetables are very important sources of vitamin C and carotene for the human diet. Genetics and climatic factors have a large influence on their content in crops as harvested. By contrast, neither the nature of the soil nor fertilizer treatments have been found to exert any large or consistent effects. The story is the

same for other vitamins in so far as they have been studied.

On the bases of present evidence it must be concluded that the state of fertility of the soil has no important influence on the content of a specific food crop or animal product, with respect to those nutrients that are at all likely to be deficient in the human diet. It must be agreed, however, that the evidence is incomplete. By no means all of the minerals and vitamins have been studied. The possibility cannot be ruled out that, because of their nature or as the result of specific treatments, certain soils may contribute values to human health that are not now visualized. The importance of this possibility, as well as the recognized gaps in present knowledge, fully justifies the continuance and expansion of research in the general field. This research must be carefully planned and controlled, however, in contrast to the superficial observations which, without any adequate data, are now used to attribute various human ills to soil deficiencies. The enthusiasts who are making these claims, in the interest of promoting various soil treatments or dietary additions, are doing both nutrition and agriculture serious harm by undermining public confidence in foods and dietary practices of unquestionable value.

By contrast, there are sound bases for promoting soil conservation and improvement as a service to human nutrition and health. More fertile soils and improved cultural practices will provide more nutrients per acre, and, particularly, more of the animal products, fruits, and vegetables that supply the nutrients most likely to be deficient in the diets of many of our people. We should not be complacent about the adequacy of our present level of food production. As we think of these things, programs for soil conservation and improvement take on an added significance accordingly.

Controlling lice on pigs, controls pig pox.

—Meaty News

Eggs and Health Make The Flock Pay

Condensed from The Rural New-Yorker

NEW YORK'S first Random-Sample Poultry Test which recently closed at Horseheads, N. Y., demonstrated the saying: "The hen that lives and lays is the hen that pays."

First in the test was Vancrest Farms of Hyde Park, N. Y. Because this entry outlaid all others and outlived most of them, it was 90 cents a bird above the runner-up in the profit column. The test clearly showed that flock health is a point not to be overlooked.

This Horseheads test took 52 chicks from each of 33 breeders. The chicks were picked at random by a county agent or some other disinterested party at the breeders' hatchery. They were raised to laying age at Cornell and then moved to Horseheads for the completion of the 500-day period. The chicks were fully exposed to leukosis during brooding. Production was not outstandingly high. Yet all entries were treated the same and some outperformed others.

We need to know how our prominent strains of poultry live, how many eggs they can lay under good management, what kind of eggs they lay and if they have other good and bad points. One test does not give the answer but repeats will give the information we want.

It did not take a test to prove that high production is terribly important in profits. The earlier the flock can hit a 50 per cent rate of lay, the sooner it begins to return the cost of raising and to give a profit on the feed bill.

But a 50 per cent rate of lay is not enough to expect from an egg flock. A good egg strain should do 75 per cent and it pays to set the sights for it. With good health in the flock, it is not a difficult mark to make.

The best time to house pullets is just before they start to lay; then you can teach them to lay in nests. They will come into a high rate of lay sooner in a house than on range unless the house is uncomfortably hot. They will lay on range but they will lay more eggs in the house.

Housing is a great change for a pullet. She may not know where to find the waterer. It is therefore a good plan to put some extra water pans on the floor for the first 10 days or so. We have known pullets to starve because they did not find the kind of waterer they had been used to.

Similarly, the pullet may not

Reprinted by permission from The Rural New-Yorker,
333 West 30th Sreet, New York City, New York, October 20, 1951

find the oyster shell or limestone in a special feeder. A shortage of calcium may cause her to lay soft-shelled eggs. Sprinkle some shell on top of the feeder for a couple of weeks. By that time she should be acclimated to the house.

Blue comb is likely to be more prevalent just after housing. This condition is not fully understood; many think it is a digestive upset. It usually pays to feed limited grain for a couple of weeks. Hold this to 40 or 50 per cent for a time and make the birds scratch for it in the litter. If you have green feed, it often helps to cut some and carry it to the flock.

If you get a drop in production and suspect blue comb, a diagnosis is in order. Poultrymen have sometimes treated what they thought was this trouble and it turned out to be cholera or typhoid. Molasses, fed mixed in a wet mash at the rate of one pint black strap molasses to four gallons of water, is rated as a good treatment. Muriate of potash, fed at a rate of two tablespoonfuls to a gallon of water for four days followed by one and a half pounds per 100 pounds of mash for 10 to 14 days, is frequently helpful. This is not a preventive treatment; use it only when there is an outbreak.

A lot of trouble and plenty of dirty eggs can be avoided if some time is spent with the flock to teach them to lay in the nests.

The heavies will not walk far to lay in nests. In the large pens, I like the Massachusetts Clean Egg Nests back to back in a row near the center of the pen. The single deckers are better than the double tier. It is helpful if you have an easy way of closing the doors at night. The heavies lay in the nests much better at first if the lids are opened for a couple of weeks. Do not put too much litter on the floor at the start and build it up later. If they lay under the nests, board or wire the space off. Spend time with them and get them laying in the nests. It pays off later.

Laying rations have almost without exception become heavier, carrying less fiber in recent years. Most rations have taken on the earmarks of high efficiency. For some reason not fully understood, birds have become more nervous. Last Winter cannibalism was more prevalent.

Some authorities think cannibalism is due to a shortage of niacin. We are not sure about this, but we are sure that debeakers are being far more freely used. Though this is the best way to prevent the trouble, it is not without its problems. A debeaked bird cannot eat out of a hopper or mechanical feeder unless it carries a reasonable amount of feed; a low level will cut production. Neither can it pick pellets or grain out of the litter easily, if the beak

is closely trimmed.

You cannot expect high production without a high rate of feed consumption. The amount of feed for 100 birds at 75 per cent production varies with the bird size. To say, as some do, that this number of Leghorns can do the job on 24 pounds, and heavies on 34 pounds, is not correct. Most Leghorns approach the four and a half to five pound class and eat 28 to 32 pounds a day; heavies require slightly more, per 100 birds.

There was a time when it seemed that a high egg strain would do just as well on a high grain ration even up to 70 per cent with as little as 30 per cent mash. That probably was not a correct conclusion, particularly for the end of the laying season. They can lay well on slightly more grain than mash until June, but then the 50–50 ratio keeps birds in better condition. It appears that a grain feeding of about 16 pounds a day to 100 heavies, and 14 pounds to Leghorns, is a good guide. They should eat enough mash to bring it to about the half and half ratio.

In May the grain ration can be cut to advantage. For a pound of grain cut, add a pound of pellets. That is a way of building up mash consumption. Follow through on this until the birds have been cut to about 12 pounds of grain. Most flocks will lay at their maximum on 40 to 50 per cent grain and 50 to 60 per cent mash and pellets. It appears that the pellets do give that extra something so badly needed in cold weather, hot weather, or when the flock is off feed.

Once upon a time we swung far away from the use of bins and chutes for time-saving in feeding. The chutes were not large enough and were on too much of a bend; mash clogged. Now, chutes are in good taste and are working well. Feed is chuted into automatic feeders, carriers and pails, saving plenty of time.

In double decker houses practically all feed storage is now put on the second floor. It is dipped out for second floor feeding, chuted to the first floor. The openings to the chutes are often level with the floor. This saves the lifting of full feed bags. Generally carriers move the feed into the pens and bring eggs out. Mechanical feeders continue to grow in popularity. While they are at their best with broilers, they do a good job with layers. Pellets and grain do not work especially well through mechanical feeders. But, if you will scatter a few pellets in a far part of the house as the feeding starts, it will attract enough birds from the feeder to let it work well.

Bulk delivery of feed has had a trial run in a number of places and everywhere poultrymen seem enthusiastic about it. The three

dollars a ton saving is not the only one. The opening of bags alone can easily consume an hour a day. Bulk delivery saves this as well as the care and return of the bags; it also saves the bag lifting. You can make the bulk bins as simple or elaborate as you want. They can be parts of feed rooms, or they can be cone-shaped bins with worm drives and motors at the bottom for hoisting the mash into automatic feeders. The feeding job can be completely mechanized. But it still requires a watchful eye to keep things rolling along.

Now, as we look at the feeding program for a flock of layers it seems to shape up about like this: Start on a super starter or high efficiency ration for four to six weeks. Then change to a growing ration and feed with an equal amount of grain. At housing time shift to a laying mash and continue the 50–50 feeding program. Feed an all-mash ration on range or in the laying house, for the results are about the same. Save time and heavy work all along the line and use it for some other productive work.

Feeding Your Swine

Condensed from The Hog Breeder

Howard Davidson and Herbert Barnes
Ohio State University

SINCE the aim of most hog producers is to produce rapid gains and to have their hogs well finished, the bulk of the ration should consist of grain which is high in carbohydrates and fat. In addition, there must be enough protein and mineral in the ration to build the frame-work and muscle, and vitamins must be present so that the other nutrients are properly digested and assimilated.

The proportion of the above nutrients needed in a ration varies considerably with the age of the pigs, and in the case of brood sows it varies with age and condition, and whether they are pregnant or suckling a litter. It is possible to obtain the correct proportions of nutrients by using a variety of ingredients; therefore, the following factors should be considered in deciding between two or more feeds of similar com-

Reprinted by permission from The Hog Breeder, Peoria, Illinois, August 1951

position:

1. Availability
2. Price
3. Ease of feeding
4. Equipment for feeding
5. Palatability.

While is is generally known that a hog cannot make rapid gains on a ration high in fiber, it has been found that hogs fed on pasture make more rapid and more economical gains than hogs in dry lot. In fact, a saving of 25 to 30 percent has often been noted in the amount of grain and high protein feed required. There are two reasons for this saving:

1. Hogs fed on clean rotation pasture are more healthy and are not so apt to be contaminated with parasites;

2. Good legume pasture contains nutrients not usually supplied in sufficient quantity in the average hog ration.

Legume pasture is high in protein, minerals, and some of the essential vitamins. Alfalfa alone or mixtures containing alfalfa have been considered as the best rotation pasture because of their high food value, their high carrying capacity, and their continuous growth throughout the year. Ladino clover is also becoming popular in pasture mixtures because it furnishes a constant, ample supply of highly nutritious forage. Red clover is probably next in line, and all of the clovers are good, with the possible exception of sweetclover, which is not so palatable and rapidly becomes dry and woody.

Rape is probably the best of all non-leguminous pastures and is quite high in protein. It has one serious drawback, and that is the danger of hogs sun-burning. This is especially true with light-skinned hogs.

Pigs should be kept on pasture during the suckling and growing period. Many men have found it advantageous to keep spring pigs on pasture until they are marketed. Fall pigs may be kept on pasture until cold weather really sets in, usually some time in December, when they are large enough to be brought into the feedlot without serious damage from parasites.

Rations for Brood Sows

Brood sows have a special job and require a slightly different feed from fattening hogs. The ration may contain more roughage, or bulk, because excess fat is a handicap to brood sows. In addition, sows are developing a fetus which is largely muscle and bone, and this requires a feed containing plenty of protein and mineral.

Summer Rations.—An excellent ration for brood sows during the summer gestation period can be made by turning the sows on good legume pasture and feeding just enough grain to keep them in

medium flesh. This should be safeguarded for young sows and gilts, however, by supplying ¼ pound of protein supplement per sow per day, especially during the last 6 weeks of the gestation period, and also supplying a good mineral mixture in a self-feeder.

Winter Rations.—Legume hay should be the foundation of a good winter ration. Either of the following rations will prove satisfactory:

Ration No. 1

Good leafy alfalfa hay in racks, free choice
1 bushel yellow corn
1 bushel oats
10 pounds mixed protein supplement
1 pound mineral

Ration No. 2

50 pounds yellow corn
25 pounds oats, wheat, or middlings
14 pounds ground alfalfa
10 pounds protein supplement
1 pound mineral

100 pounds

It is quite common for the corn to be fed as ear corn. In that case the small grain and alfalfa are ground and mixed with the protein.

Brood sows should be hand-fed so that the amount can be varied with the condition of the sows. As a general rule, mature sows will eat about 1.35 pounds of feed per day for each 100 pounds live weight while gilts will eat 1.85 pounds of feed per day for each 100 pounds live weight.

Sows and Pigs During Suckling Periods

Sows should be hand-fed for the first 10 to 12 days after farrowing. At that time they may be put on a self-feeder, provided they are nursing a good sized litter. The pigs will start eating at about 2 weeks of age.

Creep feeding such feeds as cracked corn, cracked wheat, or rolled oats at this time help get the baby pigs well started. The pigs may then be gradually adjusted to a ration that is satisfactory to both the nursing sow and the suckling pigs. An example of such a ration is:

60 pounds cracked corn
20 pounds coarsely ground wheat or finely ground oats
20 pounds 40 percent protein supplement

A mineral mixture may be mixed with the ration, 2 pounds per 100 pounds of feed, if needed. (See section on minerals.)

Pigs From Weaning to 100 Pounds

This period is often called the growing period. The ration should be higher in protein and mineral than in the fattening period, so that the pigs will grow rapidly and economically.

The ration used for brood sows and pigs during the suckling period can well be continued, although various substitutions may be made. Barley may replace a part of corn, and is worth from 90 to 95 percent as much as corn by weight. Oats or middlings may replace the wheat in the ration, although neither is worth quite as much by weight. Wheat is worth about 15 percent more than corn during this period.

Oats and middlings should be limited to one-fourth of the total ration. Some typical rations for pigs up to 100 pounds, if fed on good pasture are:

1. 65 pounds cracked corn
   20 pounds coarsely ground wheat
   15 pounds 40 percent protein supplement
2. 70 pounds cracked corn
   15 pounds finely ground oats
   15 pounds 40 percent protein supplement

Mineral mixture may be added at the rate of 1 pound per 100 pounds of feed, if needed.

Fattening Hogs

The most common practice in feeding market hogs over 100 pounds is to give them all the ear corn they will eat, with a protein supplement in a self-feeder.

The corn may be shelled and fed in a self-feeder, or other feeds may be substituted for the corn. Their value as replacements is given in the table below:

Substitutes for Corn on a Weight Basis

Feed	Value Given In Percentage
Ground wheat	100-105
Hominy feed	100
Ground barley	90-95
Wheat middlings	75-85
Ground oats*	60-80

Small grain should always be ground when fed to hogs, but there is little or no advantage to grinding the corn. Gains will be slightly faster and cheaper, but not enough to pay for the cost of grinding. Do not grind any feed too fine, as it lowers the palatability.

Protein Supplement

The need for protein supplement is greatest when the pig is small. Table 1 illustrates the changing proportion of 40 percent protein supplement to grain as the pig grows to market size.

There is a great deal of difference of opinion on the relative value of animal and vegetable proteins. Experimentally, it has made little difference in rate of gain as long as the hogs are on good legume pasture, provided additional mineral is supplied in rations containing only vegetable protein. Therefore, when hogs are

*Oats have a wide variation in weight and quality.

on legume pasture, feed either tankage, meat scrap, fish meal, soybean oil meal, linseed oil meal, or a mixture of two or more of them. Cottonseed meal can be included under those conditions.

Protein supplements that contain a mixture of vegetable and animal proteins have shown some advantage in cost and efficiency over single ingredient proteins, and decidedly so under dry lot conditions. Any of the following mixed supplements will give good results and their respective cost will determine which one to feed.

Ohio Experiment Station

24 pounds tankage, meat scrap, fish meal, or a mixture of them
40 pounds soybean oil meal
8 pounds cottonseed meal
20 pounds alfalfa meal
8 pounds mineral

100 pounds

Trinity or Trio-Mixture

50 pounds tankage
25 pounds linseed oil meal or soybean oil meal
25 pounds alfalfa meal

100 pounds

Purdue—Supplement "C"

20 pounds tankage or meat scrap
20 pounds fish meal
40 pounds soybean oil meal
10 pounds cottonseed meal
10 pounds linseed oil meal

100 pounds

Value of Soybeans for Hogs

The question is often raised concerning the possibility of feeding soybeans to hogs It is not usually advisable, because of the following reasons:

1. They are worth about 17 percent less than soybean oil meal pound for pound.

2. Unless cooked, they are not palatable to hogs. They must be ground and mixed with other feeds to make sure the hogs receive enough protein.

3. When fed in sufficient quantity to balance the ration they will produce soft pork.

Minerals

The mineral elements most usually lacking are calcium and phosphorus. Under some rather extreme conditions there has been evidence of a lack of a few other elements, but this is not general. For several years, the Ohio Agriculture Experiment Station has had excellent results with a very simple mixture. It is made up as follows:

20 pounds iodized salt
40 pounds pulverized limestone
40 pounds special steamed bone meal

100 pounds

The Ohio Station advocates the mixing of the mineral with the protein supplement, as can be noted in the ration given under

Weaning to 75 pounds	
In dry lot:	1 part supplement to 5 parts grain
On legume pasture:	1 part supplement to 6 parts grain
75 to 125 pounds	
In dry lot:	1 part supplement to 6 parts grain
On legume pasture:	1 part supplement to 7 parts grain
125 to 225 pounds	
In dry lot:	1 part supplement to 8 parts grain
On legume pasture:	1 part supplement to 10 parts grain

that discussion. If protein supplement does not contain added mineral, the mineral mixture should be kept in a self-feeder so that the pigs can have it free-choice. This is especially true when vegetable protein is the major part of the high protein feed.

When vegetable protein is used exclusively in dry lot feeding it may be wise to use a slightly more complex mineral mixture such as:

19.0 pounds iodized salt
38.0 pounds pulverized limestone
38.0 pounds special steamed bone meal
4.0 pounds ferrous sulfate (copperas)
0.3 pound copper sulfate
0.7 pound manganese sulfate

100 pounds

Can Regulate Turkey Feeding Period

Turkey raisers can vary the time of marketing their birds at the right weights by about a month by varying the protein and vitamin content of the ration. Preliminary experiments at Purdue University point to this possibility as an aid in getting birds in condition for market at the right time.

Eight lots of Bronze turkey poults, totaling 1,330 turkeys, were fed on rations containing 3 levels of protein supplement for different parts of the feeding period. The per cent protein in the turkey rations varied between 13.4 and 30.

Prof. Roy E. Roberts, Purdue turkey nutritionist, says that by increasing the protein content of the starting ration to 30% and supplying the needed vitamins, the time required for turkeys to reach market weight can be cut 2 weeks from the required time when only a 25% protein starting ration is used. The usual starting ration is 25% protein.

The feeding period of the turkey poults can also be lengthened by 2 weeks by decreasing the protein content of the starting ration. The combination feeding systems give the turkey grower a maximum variation of about 4 weeks in which to get his birds to market weight, Prof. Roberts explains.

—American Poultry Journal

Turkey Broilers

Condensed from American Poultry Journal

Tom Williams

If you are interested in the current developments in turkey broilers, we might take a "look in" on the Shenandoah Valley where this industry was first fostered to see the current developments.

Since the Shenandoah Valley is but a short distance from Washington, D. C., and Beltsville, Md., where the Beltsville White Turkey was developed, and since excellent markets are nearby for a specialty product, it stands to reason that this area is a natural for the development and promotion of this new product.

In the center of the Valley from north to south, one comes to Rockingham County, Va., which is one of the major United States poultry producing areas. In addition to the vast production of chicken broilers, turkey growing has, for several years, been a sizable industry.

There is a common misnomer that should be cleared up in any discussion of turkey broilers: a turkey broiler, when processed and sold at retail is normally used for roasting! This is contrary to popular usage. When we speak of a chicken broiler, we think of a bird 3 to 3½ lbs. that will be used for frying. About 80% of the turkey broilers that leave the Shenandoah Valley are used for roasting.

In traveling from farm to farm through the Valley, probably the one thing that impresses the visitor most, particularly if he is acquainted with the major chicken broiler areas, is the fact that as yet there has been no clear pattern established on the growing and marketing of turkey broilers.

When we speak of chicken broilers, we normally refer to a "hot house" bird about 11 weeks of age and weighing about 3 lbs. Not so with turkeys, except for those that are produced during the winter months when the weather is too severe to run them on the outside. A major portion of the turkey broilers being produced at the present time are started in the brooder house and then moved on range to be finished. Under normal circumstances, toms may be sold 2 or 3 weeks earlier than the hens.

In the winter, when the birds must be raised in confinement, growers are allowing 2½ to 3 sq.

Reprinted by permission from American Poultry Journal, Chicago, Illinois, November 1951

ft. of floor space. One of the major problems in winter that might naturally be expected is picking. Debeaking and bitting these birds becomes a necessity.

Broilers that are raised in milder weather are grown much the same as any other flock of turkeys, except that starter mash may be used during the entire growing period.

In order that one might get a clearer picture of what is being accomplished, table below gives the percent livability to marketing age, the age in which the birds were marketed, pounds per feed per pound gained, and the selling weight for spring grown turkeys on 7 farms in the Shenandoah area.

Thus far in the Valley, producers have found it very profitable to grow turkey broilers. There are several things that one must bear in mind, however, in analyzing the possibilities of producing turkey broilers in a given area.

In the first place, the turkey growers in Rockingham County carefully surveyed their marketing possibilities before they started producing the broilers. They have maintained a uniform flow into the market taking care to see that the product is sold as rapidly as produced.

The greatest fear of the people in this area is the possibility of promoters expanding the production end of this new business before the merchandising possibilities have been given sufficient consideration. As a result, there could be an over supply of the product which would naturally affect the market value. Rapid over expansion could also materially lower the quality of turkey broilers as this product struggles to find its place on the tables of America's consuming public.

	% Livability	Age Sold	Pounds per feed per pound gained	Pounds turkeys sold
(1)	84.5	17 weeks	4.1	8.7
(2)	85.4	14 weeks	3.8	6.48
(3)	88.0	16-week-Hens		
		14-wks-4 days-Toms	4.24	6.59
(4)	79.	14.4	3.81	7.09
(5)	94.	13.4 (Toms)		
		16.4 (Hens)	4.34	7.36
(6)	95.	16.4 (Toms)		
		13.6 (Toms)	4.09	7.46
(7)	88.6	15 wks-5 days	4.26	7.56

Brome Will Strangle Quackgrass

Condensed from Capper's Farmer

QUACK is a tough grass. It comes back thriftier than ever if you plow it up. The only practical way to kill it is by persistent fallowing. That has made it the most costly weed pest northern farmers have to fight. And the man who intends to farm infested land must battle it, for it overpowers flax, crowds small grain, gobbles up moisture and plant food needed by clover, corn, potatoes or other field crops.

But brome is its master! Gilbert N. Brooks, superintendent, Hancock Experiment Station in Wisconsin doesn't say brome will kill quack, but he has good proof that it will strangle it, and prevent its spread.

He said: "I never have seen an instance in which quack made headway against brome. Kentucky bluegrass fights it pretty well under extremely close grazing, but brome seems to handle it under any type of management."

Brooks suggests 2 possible reasons: (1) Brome has a root system that is superior; (2) It is leafier than quack, it starts early, and produces a shading effect. At the margin of a field where an old pasture had been plowed, he picked up a chunk of upturned brome sod. The sandy soil was beaten out of it, leaving a woolly mass of fine roots. Next, he took a visitor to a field seeded to alfalfa and brome several years ago. Adjoining it was a road right-of-way infested with a dense stand of quack. Nowhere along the field's margin had quack worked into the brome-alfalfa mixture, but in many places brome had pushed into the quack-sodded roadway. Quack likes nitrogen, but it had been unable to push into the field to get it from the alfalfa.

Brooks dug out a square foot of brome sod and a like amount of quack sod. The former was firmly bound together with a dense mass of fine, strong roots. Soil couldn't be shaken out of it. Coursing thru the quack sod were a few tough rootstocks, from which growing plants had emerged. The soil was shaken easily from this sod. Volume of root material was small compared to that of brome. This test seems to offer convincing evidence that brome has a root system with which quack can't compete. Brooks believes this is the main reason why brome holds quack in check.

Reprinted by permission from Capper's Farmer,
Topeka, Kansas, November 1951

A 12-year-old pasture at the Hancock station was worked and reseeded to legumes early in 1951. Plowing was timed so brome would renew itself without reseeding. That would insure a quick sodding and quack would have little chance to increase. Occasional quack plants could be found in all parts of the reseeded field, but brome plants probably outnumbered them 100 to 1.

At Michigan's Chatham Experiment Station Arthur R. Wolcott has observed that brome is the best quack fighter adapted to the area. He reported moderate infestation cut oat yields 30 percent. Until recent years fallowing was the only known method of control. Quack multiplies so rapidly that it had to be thinned by summer tillage before seeding a grain crop.

Wolcott's observations are a by-product of tests to find pasture and hay combinations suited to the region. He fallowed extensively to control quack, then established plots of 7 forage crops and mixtures in 1948. Each was seeded at 3 different dates, May 22, July 13 and August 7. The 2 latter seeding dates permitted summer fallow to continue longer. Result was a better kill of quack.

The best mixture, so far as quack control goes, was a seeding of 1 pound of ladino and 4 pounds of brome. This mixture produced 2,882 pounds of hay in 1948 on the plot seeded August 7. The next year it yielded 5,226 pounds. Only the first cutting of hay was taken in 1950. At the time it was harvested there was only a trace of quack and ladino in the August 7 seeding. Brome made up 99 percent of the forage yield. There was slightly more quack in the July 13 planting. For the seeding of May 22, 15 percent was quack, about 85 percent was brome and only a trace was ladino. Second best seeding was 2 pounds of ladino and 2 pounds of brome. This mix made virtually the same 2-year hay yield. The August 7 seeding was as free of quack as was the 1-to-4 seeding, but quack composition rose to 8 percent for the July seeding and 40 percent for the May 22 seeding.

Ladino seeded alone proved ideal for development of quack. The May planting was 88 percent quack, 8 percent ladino and 4 percent weeds the second year. The August 7 seeding was 55 percent quack, only 13 percent ladino and 32 percent weeds. In Ladak and Hardigan alfalfa quack grass percentage was 15 and 12 percent respectively, for the August 7 seeding; 70 percent for the May 22 seeding. The 2-year total hay yield for the July seeding of Ladak was slightly higher than for the ladino mixture but 70 percent of the total was quack, whereas only 1 percent was quack in the

July 13 seeding of 1 pound of ladino and 4 pounds of brome.

A year after these plots were seeded, Wolcott put out other mixtures. The one that has given the best quack control was 6 pounds alfalfa, 1 each of alsike, red clover and timothy, and 3 pounds of brome. About 20 percent of the 1951 stand consisted of legumes, most of which was alfalfa. About 25 percent of the grass content was quack, 30 percent brome, 40 percent timothy, 5 percent volunteer Kentucky bluegrass.

A seeding of 8 pounds of alfalfa and 3 pounds of brome was about 25 percent legumes. Half the blade grass content was brome, 45 percent quack and 5 percent bluegrass. The third mixture consisted of 6 alfalfa, 2 alsike and 1 timothy. Legumes made up only 15 percent of the forage content. The grasses were 50 percent quack, 45 percent timothy, 5 percent Kentucky blue.

There was little difference in total yield of forage. Wolcott says any preference must be based on ability of the mixture to control quack.

Last year, after Wolcott found that the content of the mixture determined amount of quack in the hay crop, he put two 5-acre fields to a mixture of ½ pound of ladino, 6 pounds alfalfa, 3 brome, 1 each of alsike and timothy. In some parts of the field little quack shows. This mixture probably is superior to alfalfa-brome because the timothy makes a faster start than brome. The latter thickens the second year to fight quack.

Avoid Cattle Bloat

Growing a pasture mixture of grasses with legumes is recognized as an important grazing practice in avoiding cattle bloat. Experiments in some states have shown that the grass-legume ratio can be controlled by the amount of nitrogen and potash that is applied. Potash increases the legume stand and at the same time nitrogen increases the amount of grass. While it is important that the potash level in the soil be high enough to support legumes, it is very important that nitrogen applications be adequate to keep the proper grass-legume balance and avoid bloat.

—Meaty News

INDEX

BEEF CATTLE

Good Way to Market Calves ——— Mar., 1951
Beef Cow's Milk Equipment ——— Mar., 1951
How to Buy a Bull ——— Apr., 1951
Free Martins ——— Apr., 1951
The Kind for Most Profit ——— Apr., 1951
T O Ranch ——— May, 1951
Estimating Weight of Steers ——— Je-Jy 1951
Acre of Grass—Ton of Beef ——— A-S, 1951
Dairy Heifer Replacements ——— A-S, 1951
Better Grass for More Beef ——— Oct., 1951
Cattle Like Dehydrated Sorghum ——— Oct., 1951
Good Bulls Are Good Gainers ——— Nov., 1951
Origin of Brahman Cattle ——— Nov., 1951
Significance of Bone in Cattle ——— Nov., 1951
Good Cattle from Good Land ——— Dec., 1951

CONSERVATION

Plow Sole and Hardpan ——— Apr., 1951
Plants for the New Agriculture ——— A-S, 1951
Problems of Grassland Farming ——— Oct., 1951
Green Revolution ——— Dec., 1951
Tall Fescue for Trouble Spots ——— Dec., 1951

CROPS

Modern Wheat Production ——— Apr., 1951
Put the Bee on Legumes ——— Apr., 1951
Plant Corn Under Cover ——— Apr., 1951
Cultivation Essential ——— May, 1951
The Right Rotation ——— May, 1951
Underground War ——— May, 1951
Alfalfa, Queen of Forage Crops ——— Je-Jy 1951
Band Seeded Legumes? ——— Je-Jy 1951
Lespedeza—Good News in 1922 ——— Je-Jy 1951
Answer to One Haying Problem ——— A-S, 1951
Alfalfa Yields New Wonder Drug ——— A-S, 1951
Ever Looked at a Seed Tag? ——— Oct., 1951
Nutmeg—Settler in the West ——— Oct., 1951
Legumes Promote Miracles ——— Oct., 1951
Reed Canary Grass ——— Nov., 1951
Seed Wheat by Thermometer ——— Dec., 1951
Hurry-up Seed Plan ——— Dec., 1951
Put Boxing Gloves on Your Seeds ——— Dec., 1951

DAIRY CATTLE

Factors Limiting Milk Production ——— Je-Jy 1951
Lost—Seven Cows ——— Je-Jy 1951
No Legs—No Cow ——— Je-Jy 1951
Good Udders are Born ——— A-S, 1951
Dairydom's Madam Xs ——— A-S, 1951
Concentrated Milk ——— A-S, 1951
How We Buy a Bull ——— A-S, 1951
Herd Sire Fertility ——— A-S, 1951
"Big Four" of Calf Raising ——— Oct., 1951
Keep Your Herd Clean ——— Oct., 1951
Make Dairy Cows Breed Better ——— Oct., 1951
Fall or Spring Freshening? ——— Nov., 1951
Antibiotic Speeds Calf Growth ——— Nov., 1951
Salt for Dairy Cows ——— Nov., 1951
How to Raise Better Calves ——— Nov., 1951
What Is a Great Cow? ——— Nov., 1951
Cull Your Low-Producing Cows ——— Nov., 1951
Long-Lived Cows a Breed Asset ——— Dec., 1951
New Approach to Calf Nutrition ——— Dec., 1951
How to Dry Off Cows ——— Dec., 1951
What If You Miss a Milking ——— Dec., 1951
Calf Scours ——— Dec., 1951

FARM BUILDINGS

Farm Wiring Goes Underground ——— Jan., 1951
Sewage is no Problem ——— Jan., 1951
Paved Barnyards ——— Feb., 1951
Barn Ventilation ——— Oct., 1951

FARM ECONOMICS

Balanced Farming in Missouri ——— Apr., 1951
Stretching Your Labor ——— Apr., 1951
Keep Leases Up-to-Date ——— May, 1951
Reorganization Would Pay ——— May, 1951
What Rent for Your Farm? ——— Je-Jy 1951
Reducing the Farm Gamble ——— Je-Jy 1951
Parity ——— A-S, 1951
Farming Goes into High Gear ——— Oct., 1951
More Use of Farm Manpower ——— Oct., 1951
Keep Your Hired Man ——— Nov., 1951
It Takes More Than Money ——— Dec., 1951
When to Hire, When to Buy ——— Dec., 1951

FARM EQUIPMENT AND MACHINERY

Care of Disposal System ——— Feb., 1951
Vacuum Lines Need Cleaning ——— Mar., 1951
Reduce Your Electric Bill ——— Mar., 1951
Permanent Trench Silo ——— Mar., 1951
More Power on the Farm ——— Mar., 1951
Sprayer Speedometer ——— Mar., 1951
Not Enough Tile—Use a Pump ——— May, 1951
Weed Control Equipment ——— May, 1951
Irrigation—5 HP Style ——— Je-Jy 1951
Electric Barn Cleaners ——— A-S, 1951
Skimpy Wiring Steals Your Money ——— Nov., 1951
Self-feeding Silos ——— Nov., 1951
Winter Care of Machinery ——— Dec., 1951
Putting the Heat on Piping ——— Dec., 1951

FEEDS

Cutting Costs of Corn Silage ——— Jan., 1951
How to Buy Mixed Feeds ——— Mar., 1951
Making Silage Can be Easy ——— May, 1951
Grass Silage Without Molasses ——— Je-Jy 1951
Feeding Grass Silage ——— Oct., 1951
Cattle Like Dehydrated Sorghum ——— Oct., 1951
Soybeans in Dairy Rations ——— Dec., 1951
Feeding Experiment ——— Dec., 1951
Place of Silage on the Farm ——— Dec., 1951

FERTILIZERS & COMPOSTS

Preserving Organic Matter ——— Oct., 1950
Liquid Manure ——— Nov., 1950
Anhydrous Ammonia ——— Dec., 1950
What about Liming? ——— Jan., 1951
Phosphorus for Good Yields ——— Feb., 1951
The Magic of Nitrogen ——— Feb., 1951
Improve Poultry Manure ——— Mar., 1951
Get the Good out of Phosphate ——— Apr., 1951
Manure Doubles in Value ——— Apr., 1951
Nitrogen ——— Je-Jy 1951

FORESTRY

*How to Measure Standing Timber ——— Mar., 1950
Partnership in the Woods ——— Apr., 1950
Wood Becomes a Cash Crop ——— Jan., 1951
Durisol from Wood Shavings ——— Jan., 1951
Chestnuts again in Our Time ——— Feb., 1951
Be Your Own Woods Boss ——— Mar., 1951

INDEX

FRUIT

Build up Humus in the Orchard ——Apr., 1951
Maleic Hydrazide ——Apr., 1951
1000 Bushels of Apples an Acre ——Apr., 1951
Minor Elements—Major Problems ——May, 1951
Cane Fruits for Home Garden ——Je-Jy
Sprayed Frost Hurries Harvest ——Oct., 1951
The Trailing Raspberry ——Oct., 1951
Controlling Mice in Orchards ——Dec., 1951

HOGS

APF and Antibiotics ——Feb., 1951
Feeding the Bred Sow ——Mar., 1951
More Pork from Less Feed ——Apr., 1951
Big Litters-Weaning Weights ——Apr., 1951
New Hope for Runts ——May, 1951
How Many Litters Per Year? ——Je-Jy 1951
Planning Your Pork Production ——A-S, 1951
Feeding Antibiotics ——A-S, 1951
Makes Hogs Out of Runts ——A-S, 1951
Guesswork out of Hog Raising ——Oct., 1951
Packaged Pigs ——Oct., 1951
The Swine Show Judge ——Oct., 1951
New "Safe" Cholera Vaccine ——Nov., 1951
Want More Pigs? ——Nov., 1951
More Pigs per Sow ——Dec., 1951
A Breeding Plan ——Dec., 1951

HORSES

Lipizzan Stallions of Austria ——Je-Jy 1951
Profit in Ponies ——Dec., 1951

INSECTS & INSECTICIDES

Spittlebug Control ——Apr., 1951
Tomorrow's Insecticides ——Apr., 1951
The Fly Problem ——Je-Jy 1951
Death for the Gypsy Moth ——Je-Jy 1951
Pest Control by Bacteria ——A-S, 1951

PASTURES

Building Better Pastures ——Mar., 1951
Renovation Boosts Pasture Yields ——Mar., 1951
Manure on Pastures ——May, 1951
Birdsfoot Trefoil ——Je-Jy 1951
Super-Pastures ——Je-Jy 1951
Kentucky-31 Fescue for Grazing ——A-S, 1951
Trash Mulch Seeding ——A-S, 1951
Stretching the Grazing Season ——Nov., 1951
Reed Canary Grass ——Nov., 1951
Learn How to Farm the Hills ——Nov., 1951
Mulches in Establishing Grasslands ——Dec., 1951

POULTRY

Fans Solve Ventilating Problems ——Feb., 1951
Saving Feed Dollars ——Mar., 1951
High Profit per Hen ——Apr., 1951
What is a 'Hybrid' Chicken? ——Apr., 1951
Better Pasture for Pullets ——May, 1951
Turkey Fryers ——May, 1951
*Fowl Leukosis Virus Isolated ——Je-Jy 1951
Controlling Newcastle Disease ——Je-Jy 1951
Automatic Feeders ——Oct., 1951
Leucosis in Poultry ——Oct., 1951
A Better Bed for Chickens ——Oct., 1951
Once Hens had Teeth ——Oct., 1951
Frozen Stuffed Chicken ——Nov., 1951
Where Do Concentrates Fit In? ——Nov., 1951
Hand Feed for Highest Production ——Nov., 1951
Goose Raising Goes Modern ——Dec., 1951
Feeding Can Cause Wet Litter ——Dec., 1951
Heat Treatment Keeps Eggs Fresh ——Dec., 1951
Cholera in Turkeys ——Dec., 1951

SHEEP & GOATS

More Trouble on the Range ——Mar., 1951
Grub Control in Sheep ——Mar., 1951
Problems for Purebred Breeder ——Apr., 1951
Shots that Save Lambs ——May, 1951
Pregnancy Disease in Ewes ——May, 1951
Crossbred Lambs ——May, 1951
Profit from Well Fed Ewes ——Oct., 1951
Two Lamb Crops a Year ——Nov., 1951
Death to Sheep Parasites ——Dec., 1951

SOILS

Legumes Help Build Soils ——Mar., 1951
Correcting Soil Deficiency ——May, 1951
Gypsum Improves Wet Soils ——May, 1951
New Soil Testing Service ——May, 1951
Rich Soils Form Honeycomb Ice ——A-S, 1951
Exciting Drugs from the Soil ——Oct., 1951
What Has Happened to Our Soil? ——Nov., 1951
Improving Tilth ——Nov., 1951

VEGETABLES

*Use a Starter Solution ——Feb., 1951
Grow Better Sweetpotatoes ——Mar., 1951
If You Want Early Tomatoes! ——Apr., 1951
Backyard Hidden Treasure ——Oct., 1951

WEEDS

Range Trouble—Halogeton ——Mar., 1951
Wider Use of Weed Killers ——Mar., 1951
Chemical Aid in Weed Control ——Apr., 1951
Broom Sedge and Tickle Grass ——Apr., 1951
An Aluminum Mulch ——May, 1951
Chemical Weed Control ——Je-Jy 1951
Fighting Weeds with Beetles ——Je-Jy 1951
Healthy Ranges Resist Hologeton ——A-S, 1951
Check Your Weed Sprayer ——Oct., 1951
Grub out Buckthorn ——Dec., 1951
TCA Controls Johnson Grass ——Dec., 1951

MISCELLANEOUS

Less Danger for Livestock ——Mar., 1951
Defoliation Chemicals ——Mar., 1951
Egypt Today, Tomorrow ——Apr., 1951
Put an End to Deer Damage ——Apr., 1951
Farming in Alaska ——May, 1951
Rainfall from Reluctant Clouds ——May, 1951
The Mighty Atom ——May, 1951
*Seed Treatment Helps Legumes ——Je-Jy 1951
*New Highways from Old ——Je-Jy 1951
Copper Deficiency ——Je-Jy 1951
With Radioisotopes ——Je-Jy 1951
New Design for Living ——A-S, 1951
The Ancients Too ——A-S, 1951
A $20 Million Microbe Hunt ——A-S, 1951
Self-Help and Point Four ——A-S, 1951
Let the Birds do the Work ——Oct., 1951
Tree Root Problem Easily Solved ——Oct., 1951
When Ideas are Exchanged ——Nov., 1951
Newest Aid in Rat Warfare ——Nov., 1951
Philippine Agriculture ——Nov., 1951
Social Security for Farm People ——Nov., 1951
U. S. Fact-Finders Abroad ——Dec., 1951
Indian John ——Dec., 1951

* Short Articles.

FOR THE FARMER'S LIBRARY

FARM MANAGEMENT MANUAL—Second Edition—Prepared by V. B. Hart and S. W. Warren, Department of Agricultural Economics, N. Y. State College of Agriculture, Cornell University. *Farm Management Manual* is a most efficient and practical manual covering the business side of farming, its risks, challenges and rewards. Long awaited, this Manual will serve as an excellent guide on such matters as prices, making the farm pay, labor saving and record keeping.

Cornell University Press — 86 pages — $2.00

FORAGES—The Science of Grassland Agriculture—prepared under the editorial authorship of H. D. Hughes and Darrel S. Metcalfe, Iowa State College, and of Maurice E. Heath, Soil Conservation Service, and 52 contributing authors, all leaders in the field of Grassland Agriculture.

Designed especially for use by organized groups, this book will be of great interest and value to farm managers and operators, to agronomists and soil conservationists, to animal and dairy husbandry specialists, to all who are interested in Grassland Agriculture. *Part I* of the book considers Forages and a Productive Agriculture; *Part II*, Forage Grasses and Legumes; *Part III*, Forage Production Practices; *Part IV*, Forage Utilization. Well written, with excellent illustrations.

The Iowa State College Press — 724 pages — $6.75

SWINE PRODUCTION—By W. E. Carroll and J. L. Krider, Professors of Animal Science, University of Illinois.

This book is designed to promote the more profitable raising of hogs as either a major or a minor enterprise of successful farm operation. Both the establishment and the operation of the swine enterprise are described, with special emphasis on Breeding, Feeding, Management and Marketing factors as they affect costs and returns.

McGraw-Hill Book Company — 498 pages — $5.75

SUCCESSFUL POULTRY MANAGEMENT—By Morley A. Jull, Head, Poultry Department, University of Maryland.

The *new second edition* of Professor Jull's well-known book presents the most recent developments and up-to-date information on the many phases of successful poultry raising and marketing. Among the important points discussed are: the kind of stock to keep, the improvement of home flocks, a score card for judging laying ability, plans for poultry houses and range shelters, health, management and marketing problems, with special stress on efficiency of operation.

McGraw-Hill Book Company, Inc. — $5.00

SUCCESSFUL GOOSE RAISING—By Lewis Glaser, Graduate of the University of Illinois College of Agriculture and long-time student of Goose Husbandry.

This booklet gives you the key to successful goose raising, with readable information on the fascinating characteristics of the goose and its long and pleasant association with man. The author discusses reasons for keeping geese, the various breeds of domestic geese, their breeding, care and management, as well as their marketing and processing. Beautifully illustrated. Attractive format.

Published by Lewis Glaser — 94 pages — $1.00

For the convenience of our readers, books listed may be purchased through this Department. Address Farmer's Digest, Ambler, Pa.

"Try as we may, none of us can be free of conflict and woe. Even the greatest men have had to accept disappointments as their daily bread . . . The art of living lies less in eliminating our troubles than in growing with them. Man and society must grow together. Each individual's efforts to discipline himself must be matched by society's struggle to enforce the rules of law and of justice under the law."

—Bernard M. Baruch

Business Press, Inc.
Lancaster, Pa.